Lesions, lemmas and *lehapu:*
Anomia in two Sesotho-English bilingual speakers.

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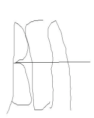
Declaration

I, Brent Ernest Archer, declare that this dissertation is my own unaided work, that I am responsible for the text of this study and all conclusions reached, and that no part of this dissertation has been submitted for a degree at any other university.



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Abstract

Rationale: Aphasia and anomia affect the communication abilities of thousands of South African stroke survivors. Therapy provision in South Africa is a challenging endeavour.

Clinicians must provide therapy to clients who speak languages which have rarely, if ever, been the focus of clinical study. Models developed for use with clients who speak English or related languages may not be suitable for speakers of other, parametrically-diverse languages. Bilingualism is widespread in South Africa, yet therapeutic insights on how best to treat bilingual speakers are only beginning to inform clinical research and practice. Time and financial support are also lacking in many clinical settings.

Aim: This study represents an attempt to establish which of four treatment conditions (initial phoneme cueing, codeswitch[1] cueing, true phonemic cueing and prosodic cueing) is most effective at facilitating improved naming performance in two Sesotho-English bilingual speakers with post-stroke anomia.

Methodology: Commercially-available tests of naming ability were found to be statistically invalid since they seemed to assess familiarity with Western culture and artifacts rather than naming ability. Working in conjunction with ten neurologically unimpaired Sesotho speakers living in the Northern Free State, community-referenced words lists were developed for use in this study.

Two bilingual Sesotho-English speakers with post-stroke anomia participated in this study. T. was assessed and found to present with classical anomia, while S. presented with output anomia. T.'s word finding difficulties are characterized by pauses, use of vocalizers and part-whole productions, while S. tends to produce semantic paraphasias during anomic moments.

[1] In keeping with trends present in research literature (e.g. Auer, 1999), codeswitching will be designated by a single, unhyphenated word.

Each treatment condition (initial phoneme cueing, codeswitch cueing, true phonemic cueing and prosodic cueing) were allocated a word list. Pre-- and post-intervention scores of naming ability on these treatment lists and four lists of semantically related words were compared. The treatment conditions were evaluated in terms of three constructs commonly employed in anomia literature: potency (the degree to which a technique helps a speaker relearn words directly targeted in therapy), semantic generalizability (the degree to which a technique helps a speaker relearn words semantically related to those directly targeted in therapy) and persistence (the degree to which therapy effects are long-lived.). The sign-test was used to determine statistical significance or otherwise.

Results and discussion: Neither initial phoneme cueing nor codeswitch cueing were associated with statistically significant potency in either participant. Both true phonemic cueing and prosodic cueing were associated with statistically significant levels of potency in both participants. None of the treatment conditions were associated with statistically significant semantic generalizability in either participant. In the case of S., codeswitch cues appeared lead to an increase in the number and complexity of semantic paraphasias. No significant decrease in any of the gains made during the intervention portion of the study were noted one month after the conclusion of the study. Explanations for these results, informed by cognitive neuropsychology, are provided. Possible refinements to models of lexical retrieval in monolingual and bilingual speakers are postulated.

Conclusion: The results of this study suggest that speech-language pathologists in South Africa should not rely solely on therapy approaches developed for use with English-speakers. Instead, a parametrically informed approach, which draws heavily on cognitive neuropsychological understandings of bilingual functioning, may be helpful in furnishing speech-language pathologists in South Africa with the tools they need to provide services. The local community needs to play a role in developing materials for use in therapy and assessment in challenging environments. New therapy techniques should be weighed against commonly used measures of therapy efficacy to determine the best course of treatment.

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To the Spirit, who cherishes and loves all of Her children.

Chapter 1: Introduction

In 2006, I completed my undergraduate speech-language pathology studies and started working as a therapist in Sasolburg, a small town in the north of the Free State province of South Africa. I had read that while no reliable incidence research for stroke in South Africa exists, prevalence studies suggest that as many as 300 per 10 000 South Africans live with the after- effects of a stroke today (South African Stroke Prevention Initiative, 2004). A correlation between HIV/AIDS has been established (Hoffman, 2001), and the high incidence of this syndrome has contributed to increasing the incidence of stroke in South Africa. The reality of these statistics dawned on me as my caseload of stroke survivors with aphasia and anomia grew. In most cases, clients with aphasia would point to anomia as the most salient and distressing symptom of their aphasic syndrome; many of the clients I worked with described the inability to name loved ones and common household objects as the most depressing and frightening aspect of their language disability. T., who would later become a participant in this study, was reduced to tears of frustration, when he could not name his wife of 20 years, and his response was by no means unique.

I soon discovered that the clinical resources available to me for working with people with aphasia and anomia were scarce, and oftentimes, inappropriate. While anomia as a symptom of aphasia has been extensively studied and is the aspect of aphasia which has received the greatest deal of attention in the clinical literature (Daniels, Stach and Maher, 2001), most of the research available was of limited usefulness to me as a South African clinician. I came to realize that attempting to apply methods developed in one language to another language is fraught with difficulty.

If I was to be an effective therapeutic partner to my clients, my therapy needed to be informed by an appreciation of the parametric differences between languages. The majority of people in South Africa today speak a Southern Bantu language, and it soon became clear to me that almost no clinical aphasiology research in any Southern Bantu language exists. Aside from challenges relating to working with speakers of rarely studied languages, I encountered a general apathy towards the discipline of linguistics among many of my colleagues at university and in clinical practice. My linguistics training barely equipped me to deal with the many tests I faced as a clinician working in South Africa.

As a multilingual South African who grew up in a multilingual society, I also understood that any workable intervention model for speech-language pathology (SLP) in South Africa must be guided by research into multilingual aphasia. While multilingualism is a topic of growing popularity in current aphasiology, very few specific techniques and methods for use in multilingual populations appear in the literature.

Over and above issues relating to a paucity of theoretical starting points for therapy, I was compelled to provide services in an environment in which other resources (such as time and financial support) were decidedly precious.

I undertook this study as an attempt to furnish the clinician working in South Africa with a few culturally and linguistically appropriate techniques for helping to remediate some aspects of anomia. Sesotho was chosen as the language of study since 10 million people in South Africa speak Sesotho, or a language which is, in linguistic terms, a dialect of Sesotho (Sepedi and Setswana) (Lewis, 2009). Since cognitive neuropsychology is a widely used, theoretically grounded approach to understanding mental functions such as word retrieval (Whitworth, Webster and Howard, 2005) which can be applied to any language, it informed the entire study from its conceptualization to its conclusion.

The clinical anomia literature was consulted to develop an understanding of current therapy methods. An appreciation of the influence of parametric factors on therapy provision lead to an analysis of the differences between English and Sesotho. This analysis in turn suggested two novel therapy techniques. Theories relating to multilingual functioning in mono- and multilingual aphasia provided ideas about therapy directions in people who speak more than one language.

Many other clinical studies of naming and therapy for naming deficits make use of commercially available naming assessments to gauge pre- and post-intervention naming abilities. Initially, I tried to use tests such as the Boston Naming Test (BNT) (Goodglass, Kaplan and Weintraub, 1983) and the naming portion of the Western Aphasia Battery (WAB) (Kertesz, 1982) to diagnose anomia. I changed course when it became apparent that these tests were statistically invalid; in other words, they test something extraneous to naming abilities. I formed the opinion that such commercial tests actually interrogate the degree to which test takers are familiar with Western culture and artifacts.

Before I could proceed, I needed to develop word lists which aligned with the cultural milieu of Sesotho speakers living in the Northern Free State. Working with ten, neurologically unimpaired first-language speakers of Sesotho, I developed four word lists, each of which would be allocated to a treatment condition. This community-referenced method of stimuli development displayed many advantages when compared to using commercially available lists. Community-referenced lists originate in the language community of study, and are thus more likely to accurately and fairly test naming ability. They are also much cheaper to obtain than commercial tests.

Once the word lists had been developed, the intervention portion of the study could begin.

Various sources of information and knowledge outlined were consulted and four techniques which form the core of this study emerged:

a. Studies of therapy for anomia prominently feature cueing as a therapy technique with initial phoneme cueing being widely used (Nettleton and Lesser, 1991; White-Thompson, 2001; DeDe, Parris and Waters, 2003; Maher and Raymer, 2004; Best, Herbert, Hickin, Osborne and Howard, 2002). *Initial phoneme cueing* was suggested by an examination of the clinical literature.

b. An exploration of the morphosyntactic differences between English and Sesotho revealed that initial phoneme cues might be of limited usefulness to speakers with anomia. In Sesotho, number morphology occurs in the initial syllable of nouns (Guma, 1971), so an initial phoneme cue is akin to a morphological cuie when a phonological cue is required. *True phonemic* *cues* (i.e. those based on the first phoneme of the bare, uninflected word) were thought to be more useful to speakers since they were hypothesized to increase activation at the phonological level.

c. Other important differences between English and Sesotho relate to suprasegmental aspects of speech. While English is a foot-timed language, Sesotho is syllable- timed (Zerbian and Barnard, 2008). The stress allocation patterns of Sesotho are much less intricate than those of English. *Prosodic cueing* which might take advantage of this simplicity in increasing naming performance, was indicated as a potential therapy technique.

d. An investigation of the psycholinguistics of bilingualism and aphasia in bilingual speakers highlighted codeswitching as possibly playing a role in remediating anomia (Roberts and Deslauriers, 1999; Munoz, Marquardt and Copeland, 1999).*Codeswitch cueing* was recommended by the available literature.

In common with previous clinical studies of anomia therapy, three constructs were selected as measures of efficacy:

a. Overall cue potency: the degree to which a cue type empowers a participant to name words on a treatment list.

b. Semantic generalizability: the degree to which a cue type empowers a participant to name words on a list semantically related to those on the treatment list.

c. Persistence: the degree to which the positive effects of a cue on naming abilities diminish over time. One month has been used as a time lapse for investigating priming in previous studies, and will also be employed here (DeDe et al., 2003).

I believe that data flowing from this study will provide an indication as to the efficacy of traditional and more innovative therapy techniques. Results relating to questions of potency, semantic generalizability and persistence will furnish the time-pressed clinician with information needed to make informed choices concerning how to best use therapy time. Only by understanding the gains that may accrue from using a given therapy technique can the clinician hope to use this resource prudently.

The old adage ‘knowledge is power’ remains as true today as ever. My hope is that the small amount of knowledge flowing from this study will empower clinicians and our clients in South Africa to make better choices about how to meet the many challenges, small and large, that make our therapeutic partnerships difficult, interesting and ultimately, fulfilling.

In this study, Chapter 2 provides a literature review on anomia. Cognitive neuropsychological approaches to anomia and therapy for anomia are considered. Aphasia and anomia in bilinguals, some psycholinguistic aspects of bilingualism, the role of codeswitching in therapy, and clinical research in the Southern Bantu languages of South Africa are also discussed. Chapter 3 provides an overview of the social history and grammar of Sesotho. Thereafter, a perspective on how an appreciation of linguistic parameters could inform therapy is provided. Differences between English and Sesotho are highlighted. The research methodology is explained in Chapter 4. Chapters 5 and 6 deal with the results of this study and a discussion thereof. The limitations of this study and possible directions for future research are considered in Chapter 7. Some concluding remarks on the relevance of this study to the South African context are made in Chapter 8.

Chapter 2: Aspects of anomia

This chapter provides an overview of current understandings of anomia. The cognitive neuropsychological (CNP) approach to mental function informs an examination of word retrieval in unimpaired speakers. CNP-inspired methods and techniques for remediating anomia as it occurs in mono-and bilingual speakers are examined. Finally, the possible role of codeswitching in therapy for bilingual people with anomia is discussed.

Anomia: general introduction

Anomia is most commonly described as a word retrieval difficulty, a disorder of the process of retrieving names of objects and other concepts (Goodglass, 1993). Lexical retrieval failures may occur in the absence of more general language dysfunction as the hallmark feature of an aphasic syndrome (also termed 'anomic aphasia') (Swindell, Holland and Reinmut, 1998) or may be a one symptom of a broader aphasia. In many cases, speakers with anomia are able to match a spoken word to a picture when the word is supplied by an interlocutor, but cannot produce the same word independently (Goodglass, 1993). Comprehension of isolated words may, however, be impaired in some cases (especially in speakers presenting with Wernicke's aphasia) (Goodglass, 1993).

At the level of conversation, some speakers appear to experience difficulty when required to retrieve the words that form the grammatical frame (most typically, pronouns, prepositions, copulas, auxiliaries and modal verbs) of a sentence despite being able to retrieve content-bearing words with much greater ease (Maher and Raymer, 2004). The opposite possibility (functors are readily retrieved while contentors present difficulty) has also been noted (Maher and Ryamer, 2004). Individual patterns of strength and weakness as regards naming abilities are thought to vary as a function of the type of aphasia the speaker presents with. During conversation, speakers with non-fluent aphasias tend to omit words that provide the grammatical framework of the sentence giving rise to the 'telegraphic speech' which is associated with non-fluent syndromes like Broca's aphasia (Goodglass, 1993). Conversely, speakers presenting with a fluent syndrome, are usually able to retrieve and use words that provide the grammatical structure of a sentence despite experiencing difficulty when the conversation requires content bearing words to be retrieved (Goodglass, 1993). Newer evidence for selective rates of impairment based on syntactic class comes from Luzzatti, Raggi, Zonca, Pistarini, Contradi and Pinna's (2002) analysis of a large corpus of data obtained from 58 speakers with aphasia. The authors associate various types of aphasic syndrome with selective rates of word impairment based on syntactic class. Evidence is provided for the view that speakers with non-fluent aphasias and aggrammatism tend to encounter less difficulty when required to retrieve nouns than verbs while fluent aphasias have been linked to an increase in verb retrieval failures. This is especially the case in speakers with Wernicke's aphasia (Luzzatti et al., 2002).

Category specific naming dysfunctions have also been identified. Speakers with category specific naming disorders are able to participate in conversation in a near normal fashion and are also able to name the majority of pictures presented during a naming task. They struggle, however, to name items belonging to a specific semantic class. Hart, Berndt and Caramazza (1985) described a speaker who recovered completely from aphasia yet remained unable to name fruits and vegetables. Similarly, Hart and Gordon (1990) studied a speaker who was unable to name animals. Some authors, however, argue that the evidence in favour of the existence of category specific anomias is not as strong as previously thought (Capitani, Laiacona, Mahon and Caramazza, 2003).

In response to naming difficulties, speakers with anomia may display the following reactions:

- Uncompensated blocking with exclamations of frustration. For example: 'I gave him a… Oh God! I know it! I can't…Why can't I say it?' (after Goodglass, 1993).
- Substitution of vague, almost semantically empty words ('thing') in lieu of nouns or similarly empty phrases ('do it') for verbs (after Goodglass, 1993).
- Circumlocutions describing aspects of the word (the appearance of an

object, or its function) without actually producing the word itself. (Wepman, Bock, Jones and van Pelt, 1973).

- Production of paraphasias, or words related in some way to the target. Several different varieties of paraphasias have been identified. "Semantic paraphasia is the unintended use of another word in lieu of the target" (Goodglass, 1993, p. 5). The error word is usually semantically related to the target. Phonemic paraphasia, by contrast, is the production of an unintended non-word which shares several phonemes with the intended, target word (Maher and Raymer, 2004). Paraphasic production may or may not be accompanied by awareness of the accuracy of names provided. (Goodglass, 1993). Many speakers who retain the ability to judge the accuracy of their own productions may attempt to self- correct when a paraphasia is produced. In practice, the verbal output of speakers with aphasia may be so disorganized, and feature so many non-words, that it may be difficult to describe a given word, or non-word, as a specific type of paraphasia with any degree of confidence (Maher and Raymer, 2004).

While conversational tasks may help to differentiate between anomia as a component of a fluent syndrome and anomia as part of a non-fluent syndrome, naming tasks appear to act as a 'great leveler'. If an element of anomia is influencing a speaker's output, performance on decontextualized picture or object naming tasks will not differ drastically between speakers presenting with different sorts of syndromes (Goodglass, 1993).

Cognitive neuropsychological approaches to understanding anomia

Cognitive neuropsychology (CNP) is a discipline which is devoted to developing information processing models of cognition (Lesser and Milroy, 1993). Earlier investigations of CNP tended to conceptualize mental processes in terms of 'boxes and arrows' (Whitworth et al., 2005) with more recent models arguing for the existence of levels and nodes (Wilshire, 2008). Cognitive neuropsychological models conceptualize the process of single word production as a series of steps, each of which is linked to the next. Information is thought to flow through the mental system proceeding from one step to the next until a final product is produced (Raymer, Maher, Foundas, Rothi and Heilman, 2000). The various components of the model become 'activated' as the information stream reaches them, and this activation allows each box or level to act on and modify the outgoing information stream (Hough, 2007).

The cognitive neuropsychological approach has been embraced by many speech-language pathologists (Code, 1989). The popularity of CNP may derive from its focus. Unlike many other conceptualizations of language deficit, CNP is not overly concerned with classifying speakers into groups, or locating the precise anatomical locus of injury, though answers relating to questions of this nature may tangentially become apparent when working within a CNP framework. Rather, CNP concerns itself with the processes that underpin mental functions (Lesser and Milroy, 1993). This focus ensures that CNP provides insights for clinicians as to how to remediate given pathologies. As Code (1989) states, a seemingly simple disorder such as naming retrieval difficulties could be due to "… a whole range of impairments, including visual or perceptual deficits, attentional deficits, failure to initialize phonetic programming, failure to access phonological specifications or lexical specifications" (p. 14). An approach which interrogates the exact processes which give rise to a so-called 'basic' behaviour like picture naming, and how the process might be impaired, provides more clinically useful information than an approach which places the speaker in a category, or tells the clinician which area of tissue has been damaged.

Coarse-grained models of word retrieval in unimpaired speakers

The process of word retrieval has been extensively studied in the field of psycholinguistics (Kess, 1992) and many models of word retrieval have been developed and modified. Patterson and Shewell's (1987) model, which appeared widely in speech-pathology literature, was for many years the starting point of most CNP-oriented investigations of anomia. An outline of a modified version of this model is given below, and where germane, other terms equivalent to those employed by Patterson and Shewell will be noted. The term 'mental lexicon' (Emmorey and Fromkin, 1988) has been used to refer to the entire system. ‘Mental lexicon’ will also be used interchangeably with ‘word retrieval system’. The focus in such mental models has always been on single word retrieval and as will soon become evident, the model proposed has limited explanatory potential when other, more complex language domains are considered.

Semantic level (‘conceptual level’ (Maher and Raymer, 2004) ‘semantic-conceptual level’ ‘semantic level’ ‘semantic store’ ‘concept store’): The semantic level is the primary storehouse of the semantic, or meaning-related, aspects of all the words a speaker is able to comprehend and produce.

At this level, when a speaker is exposed to a stimulus (e.g. a picture of a cat), a set of semantic features stored in semantic memory is activated (**an animal; covered in fur; domesticated; chases mice**) resulting in a conceptual representation.

This conceptual representation links to the next level, that of the lemma. Wei (2002) further develops the model by proposing that conceptual features are grouped into semantic-pragmatic bundles. Such a refinement of the model represents an important step in making it more realistic since speakers weigh pragmatic factors when choosing words. Context will help to determine the appropriate register for a given item; when shown a picture of food in the (formal) setting of a speech-pathology clinic, many speakers of South African English will choose the word ‘food’ even though in other contexts (at home, at work, at a social gathering) another synonymous terms such as ‘chow’ or ‘graze’ might be used. Proposing that pragmatic differences between semantically similar words are represented at the conceptual level helps to explain certain usage aspects of word retrieval.

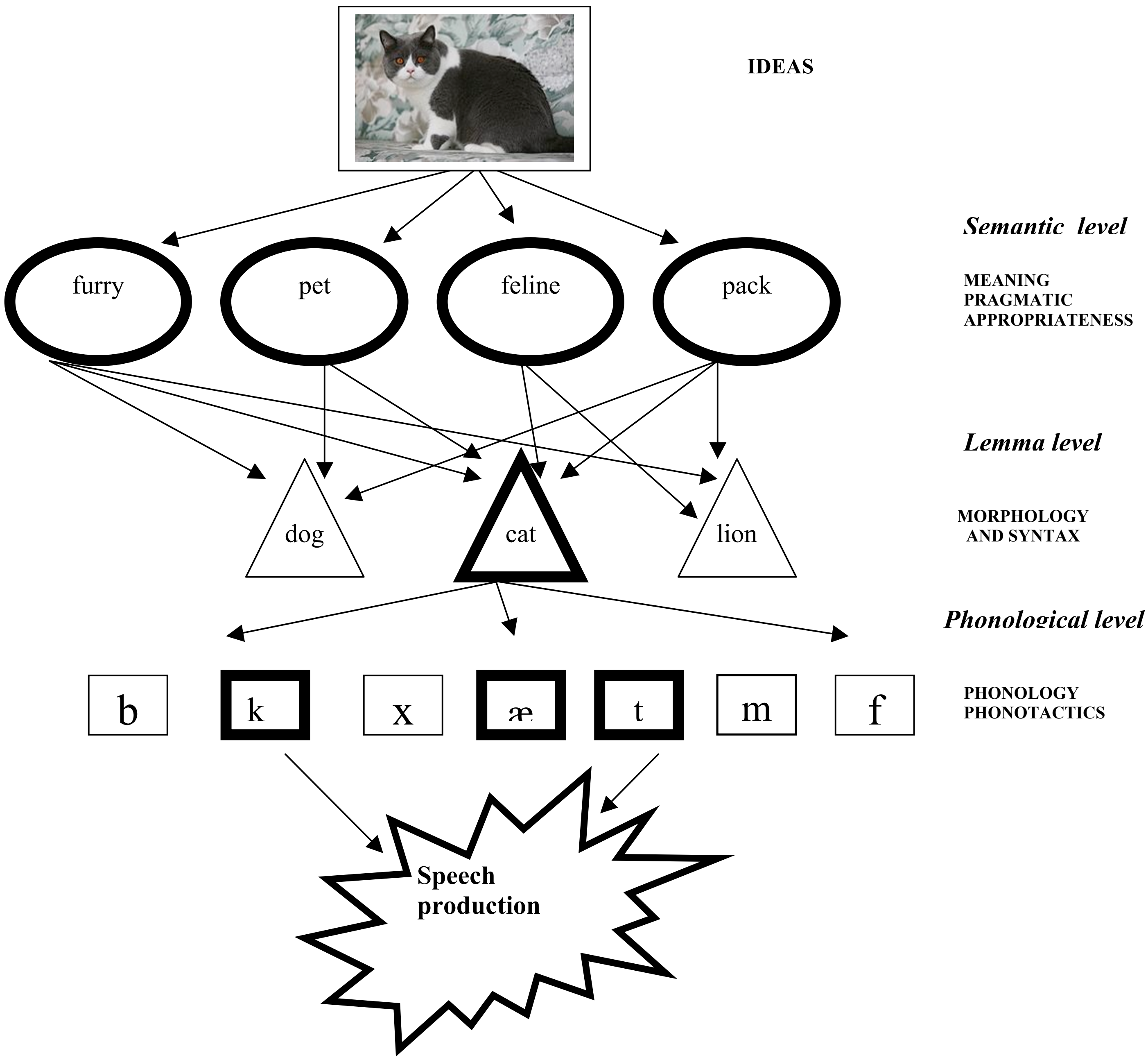

Figure 1. Hypothesized model of word retrieval in normal speakers demonstrating various levels of processing.

Lemma level: Each lemma is believed to contain information about its word. At a minimum, a descriptively adequate theory of word retrieval should argue for the syntactic status of the word (i.e. which arguments the word can take, under which circumstances can the word be an argument of other words) to be stored at the lemma level (after Levelt, Roelofs and Meyer, 1999; Wei, 2002).

Once a conceptual representation has yielded activation to a lemma, the lemma in turn will yield activation to the next level of the model, the phonological level.

Phonological level:(‘Phonological output lexicon’ (Lesser and Milroy, 1993)): Information contained at the phonological level deals with the production of the word, and so must include references to the sounds contained in the word (phonemic representation), how the various sounds in the word are to be pronounced in various contexts (allophonic representation), and depending on the nature of the language being spoken, the suprasegmental aspects of the words pronunciation though models of word production commonly used in speech-language pathology studies provide very little analysis as to how prosody is encoded.

Table 1. The mental lexicon, as conceptualized for the purpose of this study.

Level	*Function*	*Subunits*	*Alternative names*
Semantic	MEANING	Semantic-pragmatic bundles; conceptual nodes	‘Conceptual level’ (Maher and Raymer, 2004)
Lemma	MORPHOLOGY AND SYNTAX	Lemmas	‘Logogen’ (Morton, 1979)
Phonological	PRODUCTION	Phonological nodes	‘Phonological output lexicon’ (Lesser and Milroy, 1993).

Simple experiments have demonstrated that both lemmas and phonological level structures are systematically organized. In verbal fluency tasks, speakers will routinely retrieve items according to semantic criteria with produced words being grouped into themes (Weiten, 1998).Thematic grouping in verbal fluency tasks is taken as evidence for the view that lemmas are organized into semantic networks. Similarly, obscure word definition tasks, in which speakers are given a definition of a low frequency word and asked to produce the word, lend credence to the notion of phonological nodes being systematically organized (Kess, 1992). In such tasks, speakers usually produce words which are phonemically similar to the target. (e.g. when asked to produce a word to match the definition ' a navigational instrument used in measuring angular distances, especially the angle of the sun, moon and stars when at sea' speakers who couldn't produce *sextant* were very likely to produce response like *secant/sexton/sextet*). Psycholinguistically, speakers are unable to access the correct phonological nodes (due to their relatively high activation potential) and access surrounding phonological structures instead. Performance on obscure word definition tasks suggest phonological structures are grouped according to phonemic characteristics.

Speakers are demonstrably able to retrieve words according to a range of other criteria (prosodic features, orthography etc) which seems to suggest lemmas and phonological nodes may be indexed for other features as well. Just as a researcher can use a variety of terms to search a database of all the books in a library (author, topic, date of publication, language of publication, etc), speakers can retrieve words according to a range of instructions. When a speaker is asked to recite all the words he knows which start with the sound 'b', he is makes use of the index of the phonemic nodes of all the words in his phonological level. Similarly, if a speaker is asked to recite all the synonyms for 'big' that he knows, he makes use of an index of the semantic features of the lemmas of all the words in his semantic system.

Speech production apparatus: The speech production apparatus is that portion of the word retrieval system that collates information from the mental lexicon. The apparatus must integrate information from a variety of sources and provide inputs for the motor programming apparatus which plays a role in executing the actual muscular movements that comprise speech (Lesser and Milroy, 1993).

Recent innovations: enter the node

The 1980s saw several revisions to the standard model of word retrieval. As more and more empirical evidence became available, and more and more people with word retrieval pathologies were featured in research, the box- and-arrow paradigm gave way to a new conceptualization of word retrieval. Multi-modality aphasias in which writing and verbal production are impaired lead to the development of models in which distal boxes in the word production process linked via very long range arrows were replaced by the more parsimonious concept of levels and nodes.

Theorists started to argue that instead of describing the system in terms of stores houses, the notion of levels composed of nodes would be more accurate and align better with the available data. The three levels previously outlined were not abandoned as theoretical constructs but simply refined. Nodes at each level correspond to the semantic, lexical and phonological features of each word a speaker accesses. For example, the lemma ‘dog’ is thought of as being connected to the semantic nodes ‘has four legs’, ‘descended from wolves’ ‘carnivorous’ amongst others, and to phonological nodes which specify that the word is produced using the phonemes /d/ /a/ and /g/.

Figure 1 provides an illustration of the word retrieval process based on these newer conceptualizations of the system. Table 1 provides an overview of the lexical retrieval system as it is conceptualized for the purposes of this study. Of special relevance are the numerous terms used to describe analogous or even identical structures in various models.

New theories concerning the functional aspects of word retrieval accompanied this novel approach to system architecture. ‘Activation’ is central to cognitive psycholinguistic theories of word retrieval. At the semantic/conceptual level, when input is received from the senses (e.g. the speaker has been shown a picture of a long metallic object with a round head), the semantic level is searched for lemmas whose semantic features match this description. When such a lemma is located, the lemma is activated (i.e. comes online; becomes able to transmit information to other portions of the model) (Whitworth et al., 2005). At the same time, related but irrelevant lemmas are inhibited (Hough, 2007). Activation spreads to the phonological level; due to this spreading, the phonological nodes of the lemma also come online and start transmitting information to the speech production apparatus. Again, inhibition plays a central role in removing phonologically related forms from the final information stream which proceeds to speech production levels. The speech production apparatus collates this information the task is completed (in this case, naming a picture) (Raymer et al., 2000).

Every time a word is heard or produced, the activation threshold for that word is lowered. The notion of activation potential helps to explain why low frequency words take longer (in terms of milliseconds) to be recognized as words, or to be produced in reading tasks (Morton, 1979). Activation and inhibition exist in a fine balance in the mental lexicon (Hough, 2007); activation drives the entire system and ensures that various structures transmit information to those further down the chain. Too much activation leads to the accessing of forms that fall outside of the speaker's intent, leading to speech errors.

The concept of inhibition was postulated as a counterbalance to activation. Under this model, when a speaker is shown a picture of a dog, the semantic nodes related to that item come online and transmit activation to many nodes at the lemma level (not only the lemma 'dog' but semantically related items such as 'cat' 'wolf' and 'hamster' receive activation as well). The node that receives the greatest activation will transmit activation to the phonological level; all other lemmas related to the target are inhibited. The notion that activation and inhibition are in balance helps to account for semantic paraphasias, which might be thought as occurring because the incorrect node received the incorrect amount of activation. Contested issues concerning spreading activation that have yet to be settled concern cascading (can more than one lexical item send activation to the phonological nodes, or it the process gated in some way?) and feedback or feedforward (can activation flow in one direction only, or is it possible for activation to proceed from 'lower' levels up the chain?') (Wilshire, 2008).

The model outlined above has not escaped criticism. The most frequently cited weakness of this model is the fact that it is underspecified (Lesser and Milroy, 1993). While questions relating to the larger grosser aspects of the model (for example, the existence of three separate but linked entities for dealing with semantic, morphosyntactic and phonological aspects of word retrieval (Miozzo and Caramazza, 1997, in Tabossi, Collina and Sanz, 2002)) have been addressed, many questions concerning the more detailed aspects of the process of word retrieval not been settled. Questions related to how complex words composed of stems and inflectional affixes are stored in the mental lexicon have generated a great deal of debate (Janssen and Penke, 2002) although the idea that affixes are stored separately from stems is gradually gaining credence and support (Janssen and Penke, 2002). Crystal (1987) makes the especially trenchant point that the model does not address issues related to pragmatics. The selection of a given homophone, in a given situation often depends on the context; the above model is largely silent on how this might happen though Wei's (2002) contention that semantic features are grouped into semantic-pragmatic bundles is a move in the right direction. The model seems to underestimate the role that cognition plays in language functioning. It is possible to induce aphasic/anomic symptoms in normal speakers by manipulating cognitive variables (Silkes, McNeil and Drton, 2004) which suggests that cognitive components and faculties feature prominently in word retrieval, despite their lack of prominence in the discussed models. Another important aspect of language production which is missing from the model is that of prosody, with very little consensus as to the level at which suprasegmental features are encoded.

Nonetheless, the current underspecified and flawed models of word retrieval do give clinicians a good idea of where to start investigating the underlying causes of anomia, and are widely used and field tested.

Anomia typing

It is now common for clinicians to refer to a variety of different anomias, each caused by a specific breakdown at some point in the word retrieval system. A summary of the various possible sorts of anomia and the locus of dysfunction identified in CNP inspired studies is presented below. The exposition must be viewed with caution, since the word retrieval system is thought of as being exceptionally complex. Lecours, Tainturier and

Boeglin (1987) point out that aphasiologists have been known to claim that there are as many clinical forms of aphasias as there are people with aphasia; this position is entirely valid within anomia studies, given the variety of types and location of breakdowns that may occur singularly, or in combination.

Deficits at the level of the semantic system will often lead to impaired production of spoken and written words (Whitworth et al., 2005) with impaired comprehension of both the auditory and written input modalities. Semantic representations are usually degraded rather than totally inaccessible or destroyed (Lesser and Milroy, 1993). Imageability effects are typically present in that words that are readily drawn are easier to retrieve than more abstract forms (Code, 1989). Spoken language is characterized by anomia with both failures and delays in word retrieval. Semantic cues may produce semantically related responses (Goodglass, 1993). Many authors have designated anomias stemming from deficits at the semantic level 'semantic anomia' (Maher and Raymer, 2004; Martin, Serrano and Iglesias, 1999) or 'semantic dementia' (Avila, Lambon Ralph, Parcet, Geffner and Gonzalez-Darder, 2001).

Impairment at the phonological level may give rise to impaired spoken word retrieval with relatively intact written retrieval (Whitworth et al., 2005). Spoken and written comprehension of single words is also unaffected. Spoken production is characterized by delays and failures in word retrieval, the 'tip of the tongue' feeling, circumlocutions and phonological errors or the production of word fragments (Whitworth et al., 2005). High frequency and high imageability words may be less adversely effected (Wepman et al., 1973). Anomias associated with phonological level breakdowns are referred to as 'phonological anomia' (Maher and Raymer, 2004; Martin et al.,1999). Some authors further subdivide speakers with phonological anomia into those whose speech is characterized by phonological paraphasias (designated as 'phonological anomia') and those whose anomic moments resemble tip-of-the-tongue word finding difficulties in unimpaired speakers (designated as 'classical anomia') (Avila et al., 2001). As discussed above, a lack of inhibition at the level of the phonological output lexicon may lead to phonemic paraphasias (Whitworth, el al, 2005).

Of crucial importance to theoretical research and clinical practice is that fact lemmas and production nodes are usually not completely erased from the mental lexicons of people with phonological anomia. Most impaired speakers demonstrate some level of awareness of aspects of a word's functioning and production. The oft studied Italian speaker with anomia, Dante, was able to correctly furnish the gender of nouns, or the auxiliary form of intransitive verbs (Miozzo and Caramaza, in Avila et al., 2001). Other speakers have been found to be able to accurately describe the number of syllables in a word (Lambon Ralph, Sage and Roberts, 2000). A speaker presents with anomic symptoms not because crucial portions of the word production apparatus have been destroyed by neural insults. Rather, key components in the system require greater activation since the lemmas and production nodes in the damaged mental lexicon are unable to naturally provide such activation sufficient for normative speech production (DeDe et al., 2003).

Cognitive neuropsychological approaches to anomia therapy

An array of therapies and techniques have been developed to remediate anomia. The bulk of studies of anomia conducted over the last thirty years are, to some lesser or greater degree, informed by CNP theories. The CNP conceptualizations of word retrieval, and the vocabulary used to describe word retrieval function and dysfunction are ubiquitous in the literature.

Treatment studies usually revolve around noun retrieval, though a small number of verb retrieval studies have also been undertaken. Efficacy of therapy types is usually determined in the context of single case or small group studies. No consensus currently exists on how best to manage naming deficits but all therapies have in common the goal of "…increasing the strength of and access to lexical and phonological representations of words" (DeDe et al., 2003, p. 465).

CNP-based therapy tends to focus on the area of breakdown within the word retrieval system. Semantic level disorders necessitate therapy revolving around tasks that require the speaker to access and process information at the semantic level of the mental lexicon. Tasks involving access to information relating to word meaning are used for this purpose.

Any aspect of meaning (semantic features, visual properties, locations, associated items, antonym, synonymy, category membership) may be a point of focus. In its simplest form, therapy for a semantic deficit may involve matching clinician produced spoken words to pictures. Various semantic sorting tasks in which the speaker is asked to match a picture to one of a series of semantically related, written words (for example, Marshall, Pound, White-Thomson and Pring, 1990) appear in the literature. Nettleton and Lesser (1991) conducted an intervention study featuring six participants who displayed anomia as a result of breakdowns at various levels in the word retrieval apparatus. Matching among semantic associates, semantic judgments and sorting of words into semantic categories all formed part of the regimen (Nettleton and Lesser, 1991). Later studies, especially those designed to evaluate the typicality effect (the notion that training with semantically atypical items will lead to greater generalization to semantically related items than training with semantically typical items) (Kiran and Thompson, 2003), have featured verification tasks in which speakers are not only asked to name pictures, but also to adjudicate whether or not certain semantic features apply to a given picture (Stanczak, Waters and Caplan, 2006; Kiran, 2008). Semantic Feature Analysis, in which speakers are coached through a series of questions related to the semantic properties of a pictured object in the hope of strengthening links between the semantic system and lemmas, is another semantic approach to anomia therapy (Coehlo, McHugh and Boyle, 2000; Rose and Douglas, 2008). Semantic judgment tasks in which speakers are asked to assess the closeness of errors to targets have also featured in treatment regimes (Maher and Raymer, 2004).

Therapy for phonological level disorders, by contrast, usually features tasks which target the phonological aspects of word production whose execution occurs primarily at the phonological level. “In phonological treatments, patients think about how words sound…” (Maher and Raymer, 2004, p. 15).

Directing clients to focus on the initial phoneme in a word (Davis and Pring, 1991; Maher and Raymer, 2004), the rime of a word (Best et al., 2002), the number of syllables in a word (Best et al., 2002) and possible rhymes for a word (Raymer, Thompson, Jacobs, and

LeGrand, 1993) and name repetition, rhyme judgments and phonemic cueing have all been employed in phonologically based therapy (Nettleton and Lesser, 1991).

Cueing as a therapy technique

Cueing as a therapy technique has been investigated in many studies. Again, the locus of breakdown has been used to determine the most suitable types of cues with semantic cues (concerning the meaning of a word) being used for dysfunction at this level, and phonological cues (providing the speaker with a portion of the spoken form of a word) being used for dysfunction at the level of phonological processing. Little research into the relative efficacy of different word portion cues has been undertaken though Best et al.,'s (2002) study suggests that the bias towards initial phoneme cues is unfounded given that cues based on other word portions (e.g. rimes) are just as, if not more, effective than phoneme initial cues.

The neuropsychological mechanism underlying cueing therapy as implemented in speakers with phonological anomia has been elucidated by Avila et al. (2001).Word retrieval difficulties in such cases are linked not to a complete destruction of structures but rather to decreased activation. Cues are effective (i.e. they help to improve naming performance) since they provided additional activation for various portions of the mental lexicon (Avila et al., 2001). When a therapist provides a written or phonemic cue, the activation provided by the cue interacts with the residual activation flowing from the lemmas to the phonological level and from the phonological level to the speech production mechanism. The summation of these two sources of activation is then (hopefully) sufficient to enable the speaker to produce the target word (Avila et al., 2001). The repeated production of a word due to the addition of external activation may help to lower the activation potential for a word which in time will lead to the client being able to produce a given word more readily.

Therapy efficacy and design

A large number of studies support the view that therapy based on cognitive neuropsychological and related principles facilitates the relearning of items targeted during therapy (Maher and Raymer, 2004). A study by Thompson, Kearns and Edmonds (2006) showed that various sorts of cues (phonemic and sentence completion) were associated with improved naming performance for treatment lists in a single participant. In another therapeutic study, four speakers with anomia linked to insufficient activation of the phonological level ('the phonological output lexicon' to use the term which was current at the time of the article's publication) displayed improved naming abilities for words targeted during intervention after completing computer-aided cueing therapy (Bruce and Howard, 1987). Similar gains in performance on confrontation-naming tasks using treatment lists have been reported by Marshall et al. (1990), Nettleton and Lesser (1991) and Best et al. (2002). Work associated with the Complexity Account of Treatment Efficacy (a theory of stimulus ordering in therapy which is firmly grounded in cognitive neuropsychological precepts) has provided further proof for the view that therapy has a positive impact on items featured in therapy sessions (Kiran and Basetto, 2008).

Less agreement exists concerning the effect of other variables on therapy efficacy. While a qualified speech-language pathologists needs to play a leading role in designing a therapy program, some research has shown that family members can readily be trained to provide additional stimulation at home (Yampolsky and Waters, 2002). Further, the use of computers as an adjunct to therapy has also shown a great deal of promise (Bruce and Howard, 1987). While many authors agree that intense therapy (i.e. of great frequency and long duration) is preferable (Hillis, 1998), no consensus as to the optimum amount of therapy needed for significant gains has been reached (Swindell et al., 1998).

Intervention design has also been critically examined. A minority of authors are of the opinion that most speakers with anomias, both those whose difficulties are due to semantic level and phonological level dysfunction, will benefit from semantic level therapy (for example, Howard, Patterson, Franklin, Orchard-Lisle and Morton, 1985). Most authors, however, take the opposite view which argues for a word retrieval system composed of interrelated but separate layers. Some authors, such as Martin et al. (1999) argue for three layers while others such as Lambon Ralph, Moriarty and Sage (2002) hold the view that observable behaviour in people with anomia can be adequately explained by recourse to a two level model, essentially disputing the necessity of the lemma layer in theoretical models of word retrieval. Such discreteness between layers necessitates specific therapy for a specific locus of dysfunction (Whitworth et al., 2005). Phonologically-based therapies for breakdowns at the phonological level (Nettleton and Lesser, 1991; Best et al., 2002) have been discussed above. Semantic feature analysis tasks, (Kiran and Johnson, 2008) auditory-word to picture matching (Marshall et al., 1990) and written-word to picture matching (Kiran and Basetto, 2008) and gestural-supported verbal cues (Rose and Douglas, 2008) have all been successfully used by therapists to exercise function at the semantic level.

Persistence of increased naming performance in the two types of therapy has been investigated. A few authors (Nickels and Best, 1996) have argued that persistence for therapy gains is low for phonological therapy, a notion which is disputed by several other researchers such and Davis and Pring (1991). Wambaugh, Linebaugh, Doyle, Martinez, Kalinyak-Fliszar, and Spencer (2001) presented evidence which indicated that positive gains made via therapy persist at least until four weeks after the conclusion of therapy

Generalizability, here defined as the extent to which training of specific items in therapy sessions will lead to naming production gains for untrained but semantically and phonologically related items, has been a popular measure of therapy efficacy since the beginning of formal anomia research. Nickels and Best (1996) argue that semantic therapies have tended to show better generalizability than phonologically based therapies while others (Raymer et al., 1993) provide empirical evidence of generalizability as a feature of phonologically level therapy. DeDe et al. (2003) found only equivocal support for phonological generalizability in their self-cueing study.

In recent years new ideas related to stimulus-order in therapy have influenced thinking on the issue of generalizability. A method for achieving greater generalizability known as the Complexity Account of Therapy Efficacy (CATE) has recently been proposed (Thompson, Shapiro, Kiran and Sobecks, 2003). The CATE predicts that therapy will produce greater generalization when more complex items are trained (Thompson and Shapiro, 2007) which would suggest that more complex stimuli should be introduced before less complex stimuli in therapy. This order represents a departure from the accepted thinking prevalent in speech-language pathology which (at least tacitly) endorses mastering simple tasks first (see Van Riper, 1963, for example). Recent work has shown that CATE can be fruitfully applied not only to syntactic deficits but also to anomic aspects of aphasia, especially those flowing from a semantic level disorder. Specifically, CATE predicts that training more complex semantic items in a naming task (i.e. semantically untypical class items) will yield greater generalization to other members of the same semantic class than training less complex semantic items (i.e. semantically typical class items). This prediction is borne out by empirical findings (Kiran and Bassetto, 2008; Kiran, 2008; Kiran and Johnson, 2008).

Anomia and bilingualism

More than half of the world's populations are bilinguals, or people who use more than one language in daily living (Grosjean, 1989). This study is informed by Grosjean's definition of bilingualism viz. a bilingual is someone who speaks two or more languages in daily life (Grosjean, 1989). In discussing the various languages used by polyglots, this study will refer to the first language as L1, the second as L2, the third as L3…etc.

In South Africa, research and lived, clinical experience indicate that levels of multilingualism are exceptionally high[2]. If such research is accurate, it is not unreasonable to extrapolate that the majority of people living with aphasia in the South Africa and the world today are bilingual speakers. Surprisingly, aphasiology researchers persist in viewing bilingual aphasia as a special disorder; bilingual speakers with aphasia are presented as "exceptional and isolated cases" (Fabbro, 2001, p. 202).

The exotification of bilingual speakers has lead to a paucity of research on anomia as it manifests in people who speak more than one language. A special edition of the widely respected journal *Brain and Language* published in 2001 was devoted entirely to research

[2] While very little formal data on multilingualism in South Africa exists, South Africa is rated as .869 (out of a theoretical maximum of 1) on Greenberg's Linguistic Diversity Index (Lewis, 2009). This rating, the 21st highest in the world, indicates that linguistic diversity is widespread in South Africa. Due to the social and economic interactions which underpin South African society, it can be assumed that mixing between speakers of different languages has lead to South Africa becoming a multilingual nation.

on the mental lexicon. The association of prominent researchers with this journal ensures that such special editions provide a representative overview of the state of the art. Of the 58 articles appearing in the issue, 53 concentrated on phenomena as they occur in monolinguals, chiefly speakers of English and its Indo-European relatives (Libben and Jarema, 2001).

In South Africa, if all publications relating to any aspect of mono-or bilingual functioning as it occurs in Southern Bantu speakers are counted, the last forty years have produced six publications. Traill (1974) published an X-bar theory oriented paper based on his study of a Ndebele speaking person with aphasia. An unpublished thesis on inflectional breakdown in a trilingual English-Zulu-Ndebele speaking person with aphasia (Schalit, 1981) also exists. In 1992, Penn and Beecham (1992) published a study on the use of discourse analysis in assessing and treating a multilingual client (Ndebele, Pedi, Zulu, English, Afrikaans, Sesotho, Swati, Tswana, Xhosa, Tsonga). Demuth and Suzman (1997) published an analysis of developmental language impairment in Zulu speaking children. Penn, Venter and Ogilvy (2001) published an analysis of aphasia amongst a group of bilingual Afrikaans-English speakers and Penn, Frankel, Watermeyer and Russel (2009) published research which suggests that bilingual people with aphasia may display better executive functioning than their monolingual peers.

If speech-language pathologists are to effectively and ethically fulfill their professional duties, much more research on bilingual anomia (and aphasia) as it manifests in speakers of Southern Bantu languages is required.

Paraclinical aspects of aphasia in bilinguals

Most research concerning multilingual aphasia has dealt with paraclinical questions relating chiefly to recovery patterns across languages after a neural injury. Several recovery patterns have been identified in multilinguals who present with aphasia after a neural injury. In the first monograph on bilingual aphasia published by Pitres in 1895, what has become known as ‘Pitres’ Rule’ was suggested: recovery will be greatest for the language that the speaker was most familiar with pre-morbidly, regardless of the order to acquisition of L1 and Ln (Fabbro, 2001). In contrast to this statement, Ribot argued that the native language (L1) will be most recovered, even if a L2 was spoken with a high degree of familiarity and knowledge of L1 had began to stagnate (labeled 'Ribot's rule' by later authors) (Fabbro, 2001). Other possible patterns of relative recovery have appeared in the literature. Parallel recovery is characterized by a return to premorbid relative abilities with the various languages remaining at their pre--injury levels of strength (speaker remains most functional in L1, less functional in L2, still less functional in L3, etc) (Lorenzen and Murray, 2008). Differential recovery occurs in speakers where one language recovers much better than the others compared to premorbid functioning (Lorenzen and Murray, 2008). Antagonistic recovery arises when one language is initially available but fades as another language recovers (Lorenzen and Murray, 2008). Alternating antagonism, as the name implies, repeats the pattern of antagonistic recovery but the languages move through rotation with the better language alternating on the basis of a cycle that may be a day or several months long (Lorenzen and Murray, 2008). Blending recovery, in which uncontrollable mixing of words and syntactic structures from both languages occur even the speaker is attempting to speak one language, has also been noted (Lorenzen and Murray, 2008). Rare cases of selective aphasia, in which one language is impaired with no detectable deficits in the others, have been reported. (Lorenzen and Murray, 2008). Finally, successive recovery, typified by the recovery of language before the others, is also possible (Lorenzen and Murray, 2008). Research has not yet revealed how recovery patterns are to be predicted, and factors such as language status (which language was L1 premorbidly, which language was most used premorbidly), site/type of lesions, environments and contexts in which the languages were used, aphasia type and manner of language learning have been found to have a significant effect on recovery patterns (Fabbro, 2001). Translation abilities postmorbidly may also be affected in any number of ways, with some speakers unable to translate and others able to translate from one language to the other (but not in both directions) (Fabbro and Paradis, 1995). Translation without comprehension (prompt translation with a lack of understanding of the translated material) and spontaneous translation (inability to inhibit translation of own utterances, or the utterances of others) may also occur (Fabbro and Paradis, 1995).

Bilingual uniqueness: neuroanatomy and neurophysiology

A widely accepted concept in clinical multilingualism research is multilingual uniqueness, or the understanding that the multilingual is not simply several monolinguals in one person (Grosjean, 1989). A detailed discussion of the cerebral representation of all aspects of languages in bilingual speakers falls outside the scope of this current study which concerns itself chiefly with the production of single words. Focus on the lexical items and how they are stored in the brain is sufficient for the purposes of this study. Psycholinguists have long understood that multilingual word retrieval mechanisms differ from those employed by monolingual speakers. Two levels of representation posited by the standard CNP model of word retrieval (semantic and lemma) are thought to be linked in multilingual speakers. Questions relating to the nature and extent of this linkage have generated debate. Some authors, such as Kirsner, Lalor and Hird (1993) argue for a fully integrated where L1 and L2 words are stored in the same lexicon with words indexed for morphology but not for language. Others have argued that L1 and L2 lexicons remain separate in bilinguals with each sub-served by a unitary concept store (Kroll and Stewart, 1994; Wei, 2002), or that while L1 and L2 lexicons are linked, only the L1 lexicon is linked to the conceptual store (Potter, So, Von Eckardt and Feldman, 1984) with L2 words being access via L1 words. Some models make allowance for changing patterns of proficiency in bilinguals. In the initial stages of bilingualism, only the L1 lexicon may be linked to the concept store, leading to a situation where L2 words must be accessed via L1.As the speaker develops greater proficiency in L2, the L2 lexicon may begin to develop its own, autonomous links to the concept store (Kroll and Stewart, 1994). Such connections between L1 and L2 systems have only recently, tentatively been investigated for therapeutic utility in a handful of studies. Specifically targeting cognates (words in two languages which share meaning and form in two or more languages; e.g. *house* in English and *huis* in Afrikaans) in one language may lead to better production of the targets' equivalents in other languages (Costa, Santesteban and Cano, 2005; Kiran and Tuchtenhagen, 2005). Kiran and Edmonds (2006), based on research with Spanish-English bilingual speakers with aphasia, have suggested that training the less dominant language in an unbalanced bilingual speaker with anomia first may lead to greater cross linguistic generalization than training the more proficient language.

The therapeutic role of codeswitching

One widely attested multilingual behaviour is language mixing. Research relating to the interplay between aphasia and language mixing is also relatively rare. Elements of varying sizes from different languages can be mixed which has given rise to a variety of terms. Fabbro (2001) differentiates between code switching (or, the production of entire sentences in a single language alternating with entire sentences produce in another language) and code mixing (or, the juxtaposition of material within the boundaries of one sentence). Given the broad acceptance of the Matrix Language Frame Model (Myers-Scotton, 1997) in the field of codeswitching research, the terminology designated in this framework will be employed in this study; intersentential codeswitching is that which occurs between the boundaries of sentences, and encapsulates the term code switching as used by Fabbro. Intra-sentential codeswitching, which forms one of the chief focuses of this study, is defined by Myers-Scotton and the inclusion of material from two or more languages within a single sentence (roughly equivalent to code mixing, as used by Fabbro).

Codeswitching is a language phenomenon found almost exclusively in the speech of multilingual speakers (Myers-Scotton, 1997). The attitude of many researchers towards codeswitching amongst speakers with anomia and anomic symptoms has been ambivalent. Cases of pathological codeswitching in which the switch violates the contextual demands of conversation have been reported (Goral, Levy, Obler and Cohen, 2006) while other authors have noted that codeswitching is used as a retrieval strategy in non-impaired speakers who also occasionally experience the tip of the tongue phenomenon (Roberts and Deslauriers, 1999). Codeswitching may thus amount to an effective self-cueing strategy. Even in instances where codeswitching does not lead to word retrieval in the 'right' language, simply producing the word in the 'wrong' language may be sufficient for communication especially if the speaker lives in a multilingual community (Munoz et al., 1999). Since South Africa is undoubtedly a multilingual nation, encouraging speakers with anomia to codeswitch may amount to a powerful tool for boosting communication efficacy, especially in speakers who do not respond well to other types of therapy.

This chapter focused on the word retrieval disorder of anomia. Cognitive neuropsychological conceptualizations of anomia have been described and will inform this study. The mental language apparatus of bilingual speakers, aphasia and anomia in bilinguals and the role of codeswitching in therapy are all areas of interest that generate sizable amounts of international research. South African clinical research on bilingualism and the Southern Bantu languages is, by contrast, sparse. The next chapter provides an overview of Sesotho. Some ideas on how linguistic parameters might guide clinical and research practices in a linguistically diverse but research impoverished country like South Africa are also offered.

Chapter 3: Towards a parametric aphasiology

This chapter provides information concerning the social history and morphosyntax of Sesotho and informs the remainder of this thesis. I argue that linguistic parameters should play an important role in determining the design and course of speech-language therapy. Parametric differences between English and Sesotho are highlighted. Special emphasis is placed on interrogating the effectiveness of commonly used therapy techniques when working with clients who do not speak English. Novel therapy techniques, which might better align with the parameters of Sesotho than current methods, are discussed.

Pre-20th century history of the Sesotho speaking people

Pastoralist Bantu people settled in South Africa in about 200-500 CE (Louw and Finlayson, 1990). Originating in the vicinity of West and Central Africa, waves of Iron Age immigrants spread across the Southern African peninsula, displacing the aboriginal Stone Age inhabitants of South Africa (Louw and Finlayson, 1990). By the 1800's, stable patterns of settlement had emerged. Nguni speaking tribes (primarily Zulu and Xhosa) occupied the east and southern coastal regions, while a series of Sesotho kingdoms covered the southern portion of the plateau (Free State Province and parts of Gauteng) (Thompson, 2001).

The 19th century brought two events which had a profound and lasting impact on the history of the Sesotho. To the east, Shaka rose to become emperor of the Zulu people (Thompson, 2001). After transforming Zulu society from a fragmented collection of related clans into a united, nationalistic kingdom with a disciplined and permanent army, Shaka undertook a series of wars of conquest (Thompson, 2001). Zulu expansion, later dubbed *Difaqane* 'the Crushing', set off a series of eastward migrations as refugees and defeated tribes fled the onslaught (Ross, 2009). These displaced groups came into contact with the Sesotho people residing on the Highveld.

Concurrently, the descendants of the Dutch and French settlers who founded Cape Town in 1652, began arriving in Sesotho territory (Ross, 2009). Known as *voortrekkers* (pioneers), these farmers had opted to leave the Dutch colony located on the southwestern coast of South Africa after the colony ceded to Britain at the conclusion of the Napoleonic Wars (Gill, 1993). Disagreements about slavery and race relations motivated the voortrekkers to leave the confines of the Cape Colony and to attempt to create independent polities in the hinterland of South Africa (Ross, 2009).

At the time of these developments, King Moshoeshoe (also spelled <Moshweshwe> or <Moshesh>) gained control of the Sesotho kingdoms of the southern Highveld (Gill, 1993). A gifted diplomat and strategist, he was able to wield the disparate refugee groups escaping the *Difiqane* into a cohesive nation (Becker,1969). His leadership helped his small nation to survive the dangers and pitfalls (the Zulu hegemony, the violent land-greed of the voortrekkers and the designs of imperial Britain) which destroyed other indigenous South African kingdoms during the 19th century (Ross, 2009). In 1822, Moshoeshoe established his capital at Bathe-Buthe, an easily defendable mountain in the northern Drakensberg mountains, laying the foundations of the eventual Kingdom of Lesotho (Gill, 1993). His capital was later moved to Thaba Bosiu (Gill, 1993).

In order to deal with the encroaching voortrekker groups, Moshoeshoe encouraged French missionary activity in his kingdom (Sanders, 1975). Missionaries sent by the Paris Evangelical Missionary Society provided the king with foreign affairs counsel and helped to facilitate the purchase of modern weapons (Sanders, 1975). Aside from acting as state ministers, missionaries (primarily Casalis and Arbousset) played a vital role in delineating Sesotho orthography and printing Sesotho language materials between 1837 and 1855 (Casilas, 1992). The first Sesotho translation of the Bible appeared in 1878 (Legassick, 1972).

In 1868, due to continued harassment by voortrekker forces, Moshoehoe successfully appealed to Queen Victoria to proclaim Lesotho (then known as Basotuland) a protectorate of Britain and the British administration was placed in Maseru, the site of Lesotho’s present day capital (Ross, 2009). Local chieftains retained power over internal affairs while Britain was responsible for foreign affairs and the defense of the protectorate (Gill, 1993). In 1869, the British sponsored a process by which the borders of Basutoland were finally demarcated (Ross, 2009). While many clans had territory within Basotuland, large numbers of Sesotho speakers resided in areas allocated to the Orange Free State, the sovereign voortrekker republic which bordered the Sesotho kingdom.

Britain's protection ensured that repeated attempts by the Orange Free State, and later, the Republic of South Africa, to absorb part or all of Basutoland, were unsuccessful (Bundy and Saunders, 1989). In 1966, Basutoland gained its independence from Britain and became the Kingdom of Lesotho (Gill, 1993).

Sesotho today

Sesotho (also called 'Sesotho sa Lebowa' or 'Southern Sotho') is the first language of 1.5 million people in Lesotho, or 85% of the population (Lewis, 2009). Sesotho is one of the two official languages in Lesotho, the other being English (Lewis, 2009). Lesotho enjoys one of Africa's highest literacy rates with 87% of the adult population being literate chiefly in Sesotho (Lesotho Bureau of Statistics, 2006).

Sesotho is one of the 11 official languages in South Africa (Constitution of the Republic of South Africa, 1996) where it is spoken as a first language by almost 4 million people (STATISTICS South Africa, 2001). Table 2 provides information concerning the geographical spread of Sesotho in South Africa. As can be seen, Sesotho is spoken in a number of provinces, and is the predominant home language in the Free State Province.

No Statistics South Africa data on second language usage is available but a conservative estimate of the number of people who speak Sesotho as a second (or third, or fourth…) language is 5 million (Lewis, 2009).

Aside from Lesotho and South Africa, 60 000 people speak Shilozi (a close relative of Sesotho) in Zambia (Lewis, 2009). Small numbers of Sesotho speakers reside in Botswana, Swaziland and the Caprivi Strip of Namibia (Lewis, 2009).

Table 2. Percentages of people who speak Sesotho as a first language in various areas of Southern Africa.

	Percentage
Kingdom of Lesotho	85%
Free State Province, Republic of South Africa	62%
Gauteng Province, Republic of South Africa	10%
Northwest Province, Republic of South Africa	5%
Mpumalanga Province, Republic of South Africa	3%
Eastern Cape Province, Republic of South Africa	2%

(Compiled from Lesotho Bureau of Statistics data (2006) and STATISTICS South Africa data (2001)).

Sesotho is used in a range of educational settings both as a subject of study and as a medium of instruction (United Nations Educational and Scientific Council, 2000). It is used in its spoken and written forms in all the spheres of education from pre- schooling to doctoral studies (UNESCO, 2000). Difficulties still exist when using Sesotho as a technical language in the fields of commerce, information technology, science, mathematics and law since the corpus of technical materials in Sesotho is still relatively small (UNESCO,2000).

Sesotho has developed a sizable media presence since the end of apartheid. Radio Lesedi is a 24-hour Sesotho radio station run by the South African Broadcasting Corporation (South Africa's national broadcasting corporation), broadcasting solely in Sesotho (South African broadcasting Corporation, n.d.).There are other regional radio stations as well throughout Lesotho and the Free State (UNESCO, 2000). Half hour Sesotho news bulletins are broadcast daily on a government TV station. Independent TV broadcaster, eTV, also features a daily 30 minute Sesotho bulletin (eTV, n.d.). Both SABC and the eTV group produce a range of programs which feature at least some Sesotho dialogue.

There are no fully-fledged newspapers in Sesotho except for regional newsletters in Qwaqwa, Fouriesburg, Ficksburg and possibly other Free State towns (UNESCO, 2000). The popular monthly magazine *Bona* includes Sesotho content (UNESCO, 2000).

Since the codification of Sesotho orthography, literary works have been produced in Sesotho. Amongst the most notable are Thomas Mofolo's epic, *Chaka*, which has been translated into several languages including English and German (Kunene, 1989).

The social and economic position of Sesotho speakers

Both the Free State Province and Lesotho are largely rural areas characterized by widespread poverty and underdevelopment (United Nations Development Program, 2009). It can thus be reasonably argued that many Sesotho speakers live in conditions of economic hardship though people with access to land and steady employment may enjoy a higher standard of living (UNDP, 2009).

Internal migration explains why Sesotho is widely spoken throughout the sub-continent. From the beginning of the 20th century, in order to enter the cash economy, Sesotho men migrated to large cities in South Africa to find employment in the mining industry (Murray, 1981). Migrant workers from the Free State and Lesotho thus helped to spread Sesotho to the urban areas of South Africa. Migrant work is generally agreed to have had a negative impact on family live for most Sesotho speakers since adults (primarily men) were required to leave their families behind in impoverished communities while they were employed in cities located hundreds of kilometers away (Murray, 1981).

Attempts by the apartheid government to force Sesotho speakers to relocate to designated tribal reservations or 'homelands' had little effect on human settlement patterns, and large numbers of workers continued to leave the traditional areas of Black settlement throughout the last century (Bundy and Saunders, 1989). While men tended to find employment within the mining sector, women gravitated towards employment as agricultural or domestic workers (Bundy and Saunders, 1989). The allure of urban areas has not diminished and internal migration remains a reality for many Black people born in the Sesotho and other heartlands today (Posel, 2003).

Generally, employment patterns amongst Sesotho speakers follow patterns pertaining to broader South Africans society. Due to historical factors, unemployment amongst Sesotho speakers and other Black South Africans remains high (Arora and Ricci, 2004). Professional people are employed in the education, health, medicine, legal and political sectors. Others find employment in the civil service and business.

In terms of religion, the central role that Christian missionaries played in helping Moshoeshoe secure his kingdom helped to ensure widespread conversion amongst Sesotho people to Christianity. Today, the bulk of Sesotho speakers practice a form of Christianity which blends elements of traditional Christian dogma with local, pre--Western beliefs. Modimo (God) is viewed as a supreme being who cannot be approached by mortals; the favour of ancestors, who act as intercessors between Modimo and the living, must be cultivated through worship and reverence (Bereng, 1987).

Relationship of Sesotho to other languages

Sesotho is classified as a member of the southern Bantu branch of the Niger-Congo language family (Bailey, 1995). In terms of close relatives, Sesotho is closely related to Tswana, a language spoken in the Northwest Province and Botswana and to Pedi (a.k.a Northern Sesotho), which is spoken in the northern areas of South Africa, especially in Limpopo Province (Lewis, 2009). Shilozi, today spoken only in Zambia, is believed to be related to Sesotho (Lewis, 2009). Phuthi (a Nguni-Sesotho hybrid spoken in the border areas between the Highveld and KwaZulu-Natal) draws heavily on Sesotho (Donnelly, 1999). Tsostitaal, or Flaaitaal, the urban shibboleth used by township youths also features a large amount of material from Sesotho (Makhudu, 1995).

Phonology of Sesotho

The phonetic inventory of Sesotho consists of a total of 39 consonantal phonemes and 9 vowel phonemes (Mokoena, 1998). The consonants include affricates, palatal and postalveolar consonants, as well as three click consonants (Mokoena, 1998).

The phonotactics of Sesotho are similar to those of other Bantu languages. Sesotho is a syllable timed language with stress falling on the penultimate syllable of a sentence, phrase or word (Zerbian and Barnard, 2008). The rule of penultimate stress has a few, limited exceptions (Zerbian and Barnard, 2008) .Stressed syllables are slightly longer and has a falling tone (Doke and Mofokeng, 1974). Unlike in English, stress does not affect vowel quality or height (Zerbian and Barnard, 2008).

Syntax of Sesotho

Sesotho is typically classified as an agglutinative language which constructs whole words by joining together discrete roots and morphemes with specific meanings (Guma, 1971). Basic Sesotho word order is subject-verb-object (Demuth, 1983). However, because the verb is marked with the subject and sometimes the object, this order may be changed for purposes of emphasis (Demuth, 1983). While most language textbooks tend not to frame descriptions of Sesotho using terminology originating in generative syntactic studies, an examination of educational texts will reveal certain facts about Sesotho. No grammatical case marking exists. Rather, thematic roles are indicated by a combination of word order and agreement markers on the verb, with no change to the nouns themselves. Further, Sesotho could be classified as a head-first and pro-drop (as defined by Culicover and Jackendorff, 2005).

In common with other Bantu languages, Sesotho nouns can be divided into a number of noun classes. Each noun class has its own singular and plural markers which are applied with some degree of regularity. Diminutive, augmentative, demonstratives, interrogative, possessives, enumerative and locative particles all assigned according to noun class membership with each class having a (nearly) unique set of affixes (Doke and Mofokeng, 1974) As discussed in Chapter 3, there are 18 noun classes in Sesotho.

The role of parameters in therapy

While many authors support the view that aphasia will affect different languages differently (Menn and Obler, 1990; Grodzinsky 2000), an appreciation of parametric (in the Chomskyan sense) considerations is only slowly filtering into clinical anomia research. A commonly used therapy technique for speakers with phonological anomia is phonemic cueing (Nettleton and Lesser, 1991; White-Thompson, 2001; DeDe et al., 2003; Maher and Raymer, 2004; Best et al., 2002). All of the referenced studies, which provide accurate indication of the state of the art, focus on initial phonemes as cues. This almost exclusive focus on the initial phonemes is understandable, given that the bulk of research has been conducted in European languages, with English being the most studied language. Initial phoneme cues work well for many English words because of the nature of English morphology. Due to the effects of parametric variation, speakers of languages which derive and inflect words in ways alien to English speakers may not find initial phoneme cues as useful. Speakers of Southern Bantu languages which feature rich systems of noun class prefixes fall into this category.

If a therapist is trying to cue a client to produce the word ‘running’, an initial phoneme cue may be effective since it would help to activate the phonological nodes of the needed word. Most therapists would avoid giving a final syllable cue (such as ‘the word ends in –ing’) since this would do nothing to induce activation at the phonological level. Instead, such a cue activates the morphosyntactic aspects of the word. While some debate exists as to the location of information relating to the morphological aspects of words (Kess, 1992), it is generally agreed that such information resides somewhere elsewhere than the phonological level of the word retrieval apparatus. So, in English a word final cue leads to activation at the semantic or lemma levels but does nothing to encourage activation at the phonological level, which is what is required in many cases. The –ing in ‘running’ amounts to a morphological cue when a phonological cue is required. That English tends to add morphemes to the ends of words, is simply a happy accident which makes initial phoneme cues useful.

A clinical analysis of some aspects of Sesotho morphosyntax

Sesotho, and other languages of the Bantu family, feature a rich system of prefix morphology. An overview of the Sesotho noun class system appears in Table 3. Since this study revolves around picture naming tasks, this discussion will focus solely on prefixes relevant to noun use in Sesotho. Like many other Southern Bantu languages, Sesotho is classified as a noun class language, or a language in which every noun is a member of a noun class.

As can be seen from Table 3, several other syntactic classes aside from nouns (prepositions and an infinitive particle) are listed, primarily because they are inflected in regular manner, and thus have more in common with nouns than words from other syntactic classes. Classes 1-10 (typical nouns) are arranged according to the two numbers of Sesotho, singular and plural. While exceptions do exist, Table 3 illustrates that the initial phonemes of most Sesotho nouns communicate information about the number of the noun being used or about semantic aspects of the word. For example, membership of classes 1 and 2 is based on semantic considerations with the majority of nouns that fall into these two groups being words used to describe people (*ruta* – preach; *moruti*- preacher; *baruti* – preachers; *rena* – rule; *morena* – king; *barena* – kings). The *mo-ba-* paradigm seems to be fairly productive and can be used in creative, even metaphorical ways: *dimo* – particle denoting 'up' *Modimo* – God ('Being Who is 'up' above us'). Membership of classes 2-10 appear to be semantically random. The initial phonemes of Sesotho words are thus similar to the plural suffixes found in English (-s with various phonetically conditioned allophones for the majority of nouns).

The therapist who is aware of parametric differences between languages might avoid using these initial phoneme cues when working with people who speak Sesotho, since cueing a client for the word 'tigers' *dinkwe* by providing the initial phonemes (*di-)*, is more or less equivalent to cueing an English speaking client for the same word by telling them it ends in an –s.

Table 3. Noun classes in Sesotho.

Class	*Prefix*	*Noun*	*Gloss*
1	*mo-*	*motho*	person
2	*ba-*	*batho*	people
3	*mo-*	*molomo*	mouth
4	*me-*	*melomo*	mouths
5	*Le-*	*lehapu*	watermelon
6	*ma-*	*mahapu*	watermelons
7	*Se-*	*seledu*	chin
8	*di-*	*diledu*	chins
9	*n-*	*nkwe*	tiger
10	*din-*	*dinkwe*	tigers
Classes 11,12 and 13 are non-existent in Sesotho but are found in languages belonging to the Nguni branch of the Southern Bantu family.			
14	*bo-*	*borokgo*	bridge
15	*ho-*	*ho nwa*	to drink
16	*Fa-*	*fatshe*	down
17	*ho-*	*hodimo*	up
18	*mo-*	*morao*	back

(from Mokoena, 1998).

A psycholinguistic examination of the effect of such a cue helps to shed light on why another approach may be better. Even using the current underspecified models, it is clear that providing a morphosyntactic cue partially activates the morphosyntactic aspects of the needed word but probably won't do very much to activate the phonemic nodes. A more psycholinguistically sound option may be to provide a cue of the first phoneme of the bare, uninflected word, or a true phonemic cue. Not only does this accord well with models of word retrieval since such a cue partially activates the phonemic nodes which plays a central role in word production, it aligns well with knowledge of the parametric variations which distinguish Sesotho from English.

A clinical analysis of some aspects of Sesotho prosody

Aside from significant differences in morphosyntax, Southern Bantu languages and English differ in terms of suprasegmental aspects of speech. Stress is here defined as the perception that a syllable is stronger or more prominent than its neighbors (Ladefoged, 1975). English is classified as a foot-timed language (Rogers, 2000). Foot-timed languages are those languages in which the rhythm of a spoken sentence is determined by the position of strong syllables (or stressed syllables) in a sentence (Ladefoged, 1975). In English, stressed syllables are fractionally louder, longer and lower pitched than unstressed syllables (Clark and Yallop, 1994). Sesotho, by contrast, is a syllable-timed language. In syllable-timed languages, sentence rhythm does not revolve around the position of stressed syllables, nor is each foot equal in length (Clark and Yallop, 1994). Rather, the length of a sentence is in direct proportion to the number of syllables in the sentence (Clark and Yallop, 1994). In Sesotho, the stress always falls on the penultima, or the second last syllable in a sentence (Doke and Mofokeng, 1974). For the clinician, an examination of suprasegmental aspects of word production may yield possible therapy techniques. Since, in all languages the phonological level must provide input to the speech production apparatus, suprasegmental cues (i.e. those relating to the prosodic nature of the target word) might possibly provide more activation for the speech production apparatus than other types of cue. This technique may prove to be effective to different degrees in different languages due to parameters relating to suprasegmentals.

Table 4 summarizes the parametric differences between English and Sesotho which are relevant to this study.

Table 4. Important parametric differences between English and Sesotho.

English	*Sesotho*
Foot timed	Syllable timed
Analytical	Agglutanative
No gender (except for small number of pronouns)	Noun class language

This chapter has provided a brief overview of selected aspects of Sesotho grammar and history. Parametric differences between English and Sesotho were considered and a widely used therapy technique (initial phoneme cueing) was argued to be ineffective given the nature of Sesotho morphosyntax. An examination of the parameters of Sesotho suggested two new, possible therapy techniques i.e. true phonemic cueing and prosodic cueing.

Chapter 4: Methodology

This chapter outlines the methodology that underpinned this study. Stage One (stimuli development) and Stage Two (intervention study) are both delineated. The four treatment conditions which form the basis of this study (initial phoneme cueing, codeswitch cueing, true phonemic cueing and prosodic cueing) are explained. The three constructs which were used to assess the conditions (potency, semantic generalizability and persistence) are defined. Criteria for selecting participants are listed. Each participant (n=2) is described using concepts drawn from the CNP school.

Research aims

In keeping with the parallel case study approach employed in CNP rehabilitative literature (Thompson et al., 2006), this study aims to examine the clinical effectiveness of different cueing-based treatment techniques in terms of facilitating improved naming performance as it occurs during naming tasks. Two bilingual speakers of Sesotho and English who have anomia as a sequela of cerebral vascular accidents acted as participants in this study.

Study setting

As outlined in Chapter 1, this study was conducted at Metsimaholo District Hospital, located in Sasolburg, a town of approximately 100 000 people located about 70km south of Johannesburg, in the Free State Province. Sasolburg is an industrial town surrounded by farmlands.

Ethical clearance

Ethical clearance was obtained from the Humanities Ethics Committee (Non-medical). Permission was obtained from the research site and both participants.

Research design

This study was divided into two stages. Stage One focused on developing word lists to be used in Stage Two. Stage Two focused on comparing the clinical efficacy of various cueing strategies for facilitating confrontation naming in two participants.

Stage One: Stimuli development

Word list development

As discussed in Chapter 1, commercially available word lists were found to be statistically invalid for the purposes of this study. In keeping with a variety of other clinical examinations of cueing therapy (Rose and Douglas, 2008; DeDe et al., 2003; Best et al., 2003) a study-specific series of word lists were developed. The vocabulary list provided in Mokoena (1998) was used as the basis for the word list. Several criteria for minimizing the effects of extraneous variables related to the list were suggested by previous research:

a. The word had to be easily 'drawable' (rendered in picture format) so as to avoid imagability effects (Maher and Raymer, 2004).

b. The word had to be attested to as a word existing in the dialect of Sesotho spoken in the Northern Free State by at least 10 normal speakers. This step was taken to ensure that the concept underlying the word formed part of the typical socio-cultural milieu of first language speakers of Sesotho living in the northern Free State in the early 21st century. This measure helped to counter extraneous effects related to the cultural context in which words are used. The unimpaired speakers who participated in this portion of the study are described in Table 5.

c. The word had to be easily translatable from Sesotho to English. Culture-specific terms which do not have English equivalents were excluded. Under this criterion, borrowed items were not excluded since in any language a large proportion of common words may be borrowed from other languages (Campbell, 2004).

d. Words simply had to demonstrate evidence of assimilation i.e. conform to accepted patterns of Sesotho phonology and phonotactics as defined by Doke and Mofokeng (1974) and Zerbian and Barnard (2008).

e. The word had to belong to the syntactic class 'noun' so as to avoid effects related to syntactic class membership (Hough, 2007).

f. Most studies of word retrieval attempt to avoid effects related to frequency (e.g. variable threshold activation levels (Morton, 1979)) by selecting items that all have similar frequencies of usage. A corpus, usually based on a large amount of written language, is usually consulted. Currently, no large corpus of written Sesotho materials exists. Nonetheless, in order to qualify for use in this study, English translations of the words had to fall within frequency ranges as defined by the SUBTLEXus Corpus (Brysbaeart and New, 2009) (3 words per million). The SUBTLEXus Corpus was found to be ideal for the purposes of this study since it is based on a large number of items (51 million subtitles produced for motion pictures). The emphasis on spoken language further recommended the SUBTLEXus Corpus since Sesotho remains a language in which written material is relatively scarce.

g. Since some controversy exists regarding the manner in which words and affixes are stored (Jannssen and Penke, 2002), plurals were excluded from the lists.

Once these criteria had been applied, four word lists were developed. The word lists used in this study consisted of the following numbers of items:

- BODY PARTS: 20 items (10 treatment, 10 semantically related).
- FOOD AND DRINK: 20 items (10 treatment, 10 semantically related).
- HOUSEHOLD ARTIFACTS: 20 items (10 treatment, 10 semantically related).
- ANIMALS: 20 items (10 treatment, 10 semantically related).

TREATMENT SETS TOTAL: 80 words

SEMANTICALLY RELATED SETS TOTAL: 80 words.

(see Appendix IV for full lists of words used).

Table 5. Unimpaired participants who aided in attestation of words for use in this study.

Participant	*Age*	*Educational Level*	*BNT Score*	*WAB: Naming total*	*PALPA: 53. Picture Naming*	*Confrontation naming score for study word-list*
SV	28	16 years	14	7	35	78
MR	34	16 years	12	6	36	79
DT	31	12 years	9	8	33	80
JM	44	12 years	9	5	34	77
SM	45	12 years	8	7	33	80
BM	27	12 years	10	4	35	80
NM	37	10 years	10	8	31	80
KM	31	10 years	9	5	30	79
LT	30	10 years	8	6	31	80
SD	41	10 years	8	6	31	77
Average	34.8	12	8.9	6.2	32.9	79

(BNT scores all /60 (Goodglass et al., 1983); WAB Naming mean score for speakers with aphasia: 5.5 (Kertesz, 1982); PALPA Picture Naming mean score for unimpaired speakers (Kay et al., 1992); Confrontation naming all /80).

Since one of the conditions in this study is based on the use of true phonemic cues, items which conformed to the traditional patterns of Sesotho noun class morphology were used in the treatment sets, while items that conformed less exactly to noun class morphological patterns were used in the semantically related sets. This step was taken because words that apply to the morphological noun class paradigm lend themselves more easily to the production of true phonemic cues than those that do not.

The transcription system developed by Doke and Mofokeng (1974) was used throughout this study.

As can be seen above, all lists were further subdivided into two sets: a treatment set and a semantically related set. The treatment set was used to measure potency, while the semantically related sets were used to measure semantic generalizability.

Receptive screening

This study occurs within the framework of rehabilitation which can be defined as the regaining of lost function after an injury. Rehabilitation concerns itself with relearning previously acquired skills, and usually does not focus on learning novel skills which did not exist premorbidly. Similarly, this study was focused on relearning items that had previously been mastered, and not on learning of items that were completely new to the participants. Furthermore, this study focused primarily on Sesotho as a language spoken by two people with anomia.

In order to ensure that participants were familiar with the Sesotho versions of the items on the word lists, before the commencement of the cueing portion of this study, a receptive screening took place. For both participants, semantic functioning on a receptive level was found to be near normal. During the receptive screening task, participants were asked to match an auditorily presented label (i.e. a spoken word) drawn from the word lists to one of four pictures (one correct, three distracters). If a participant could not correctly match the word to the picture, this was taken as evidence that the word had never been part of the participant's mental lexicon. Such words were removed from the study.

Picture production and screening

Full colour photographs representing the words were sourced from online catalogues or from photographs taken solely for the purposes of this study using a digital camera. In order to be included in the study, pictures had to have a minimum size of 80 kilobytes. To achieve uniformity across pictures, pictures had to be printable at a minimum size of 177.8 millimeters by 215.9 millimeters (double standard post card size) without pixilation. All pictures were pilot tested on 10 unimpaired Sesotho speakers from the Northern Free State. Pictures which were not readily named by more than 4 non-impaired speakers were replaced with better representations. Items which caused confusion (e.g. many speakers identified the photograph of a mouse as a rat, and vice versa) were removed from the list.

Group allocation and balancing

In clinical studies of anomia, word lists that are allocated to various experimental conditions may be balanced to avoid advantaging any one condition above the others. In order to balance lists for syntactic class, only nouns were used in all lists. In order to balance lists for phonetic length, only words of four syllables or shorter were used in all lists.

Since one of the conditions in this study seeks to interrogate the clinical usefulness of true phonemic cues, items which conformed to the traditional patterns of Sesotho noun class morphology (as illustrated in the Introduction) were allocated to the true phonemic cueing condition. This step was taken because words that apply the morphological noun class paradigm lend themselves more easily to the production of true phonemic cues than those that do not.

Stage Two: Intervention study

Intervention study design

Relative treatment efficacies were investigated in a multiple-baseline across conditions small-group experimental design (McReynolds and Kearns, 1983). The treatments were delivered in four conditions: a condition based on the use of prosodic cues, a condition based on the use of true phonemic cues, a condition based on the use of initial phoneme cues and a condition based on the use of codeswitching cues. Three baseline session were carried out during which the participants were asked to name all the picture stimuli to be used in the study and to participate in various other pretreatment evaluations. The baseline sessions were followed by eight treatment sessions (2 per condition). The treatment sessions were followed by three post treatment sessions in which some of the measures administered during baseline sessions were readministered. The study concluded with a follow up session one month after the completion of the study. All sessions were 45 minutes in duration and occurred at the rate of one session per week. All sessions were carried out at Metsimaholo District Hospital in Sasolburg.

Baseline measures

The following pre-study measures were used to gauge the participant's general language functioning and to ascertain the extent and nature of anomia:

a. Sesotho adaptation of the Western Aphasia Battery (Kertesz, 1982) scored as per test manual. Where no Sesotho terms were available for those used in the test, the English item was substituted.
b. Sesotho adaptation of the Boston Naming Test (Goodglass, Kaplan and Weintraub, 1983) scored as per test manual. Where no Sesotho terms were available for those used in the test, the English item was substituted.
c. Selected portions of the PALPA (Kay et al., 1992), adapted into Sesotho. The following subtests were used and scored as per the test manual: 8. Repetition: Nonwords, 9. Repetition: Imageability and Frequency, 36. Oral Reading: Nonwords, 45. Spelling to dictation: Nonwords, 47. Spoken Word-Picture Matching, 48. Written word- picture matching, 53.1 Spoken Picture Naming, 53.2 Written Naming, 53.3 Oral reading, 53.4 Repetition, 53.5 Written spelling, 54. Picture naming. The nonword tests were conducted using nonwords that conform to the phonotactic patterns of Sesotho[3]. These adapted nonwords were based closely on the phonological and syllabic structure of the words used in the original test. For example, *vater (*featured in 8. Repetition: Nonwords) was adapted to become *vate.* Phonemes which appear in English and not Sesotho were replaced by the nearest Sesotho equivalent (an inventory of the phonemes of Sesotho appears in the Appendix). Spelling of nonword items was changed to align

[3] Sesotho words are built around syllables which usually consist of a consonant followed by a vowel (CV). Consequently, the final phoneme of most words is a vowel (Zerbian and Barnard, 2008). Clusters of phonemes are not permitted although co-articulations regularly occur (Zerbian and Barnard, 2008) (e.g. *kgotso* 'peace' has a affricate consisting of a velar stop and fricative as its initial phoneme; similarly, *tswara* 'arrest' features a alveolar affricate co-articulated with labial rounding as its first phoneme).

more closely with Sesotho orthography as outlined in Doke and Mofokeng (1974). Where no Sesotho terms were available for those used in the test, the English item was substituted.

d. Confrontation naming score for all experimental word lists (total of 80 words). During this task, pictures were randomly arranged and presented one at a time. No input was provided by the researcher. If the participant did not respond within 30 seconds, the next picture was presented. This task was scored as per the following coding system:

- An immediate, correct response: CORRECT.
- A delayed, correct response: CORRECT.
- An immediate/delayed response which differed from the correct response by a single phoneme: CORRECT.
- An immediate response which differed from the correct response by two or more phonemes followed by a period of silence or task related commentary followed by a response which differed from the correct response by a single phoneme: CORRECT.
- An immediate/delayed/partial response which differed from the correct response by two or more phonemes: INCORRECT.
- No response: INCORRECT.

(scoring scheme adapted from Francis, Clark and Humphreys, 2002).

Cueing procedures

The study consisted of a naming task accompanied by the use of cues associated with each of the four conditions outlined below. In all naming tasks, the participant was asked to provide the Sesotho name for the relevant picture. Pictures were presented in random order. Each word list was presented ten times.

In order to ensure participants were exposed to each cue type the same number of times, the following protocol was used for cue presentation across conditions:

1. Participant instructed not to name picture until he/she has been given the cue.
2. Participant shown picture.
3. Cue provided.
4. Participant requested to name picture.
5. If the participant was unable to name the picture within 20 seconds, the interpreter would repeat the relevant cue a maximum of three times.
6. If the participant was unable to name the picture after three presentations of the cue, the researcher would name the picture and request the participant to repeat the name.

Cueing conditions

Condition 1: (Prosodic cue, PROS): Use of a prosodic cue. In this condition, the interpreter provided a non-phonemic, hummed version of the word featuring the correct number of syllables. All hummed syllables consisted of a repetition of /m/ ('mmmm'). The hummed syllables reflected the relative stress patterns of the word (e.g. in the word *sefate* 'tree' the stress falls on the second syllable. The hummed version of this word consisted of three 'mmm' syllables with the second being slightly longer, louder and higher in pitch than the other two).

Condition 2 (Initial phoneme cues, IPC): Use of initial phoneme cues. In this condition, the interpreter would provide the first phoneme of the word.

Condition 3 (Codeswitching, CS): Use of codeswitching cues. In this condition, the interpreter provided the spoken word in English.

Condition 4 (True phonemic cues, TPC): Use of true phonemic cues (provision of the first phoneme of the bare uninflected/underived stem). In this condition, the interpreter provided the true phonemic cue for the word.

In order to measure gains associated with each cue type, each condition was allocated specific word lists. Word list allocation was structured so that each condition was allocated the same number of items. The order in which treatment conditions were placed was randomly determined.

Table 6 summarizes baseline/post-treatment measures and treatment application as they occurred over the course of the sessions.

Participant selection

Two adults with acquired aphasia participated in this study. In order to control for effects related to spontaneous recovery (Lyon, 1997), only participants who had been living with aphasia as a result of a stroke for a year or more were included. All participants were recruited from the caseload of a speech-language pathologist employed at a state hospital and informed consent was sought from all participants before they enrolled in this study.

Special emphasis was placed on ensuring that the participants understood the scope and nature of their role in the study. All consent forms were adapted into Sesotho, and an interpreter as well as the participants' primary caregivers were asked to explain the above issues to the participant. In order to avoid the therapeutic misconception (Penn, Frankl, Watermeyer and Muller, 2008), the researcher explained to the participants that participation in the study would not necessarily lead to beneficial results. The participants were referred to sites and organizations providing speech-language therapy at the conclusion of the study.

In order to be included in this study the participants had to present with an aphasic syndrome which featured anomia as its chief symptom. Given the severely under-resourced context in which this study was conducted (a rural African hospital) no objective means of assessing the site of lesion, such as computer aided tomography (CAT) or magnetic resonance imaging (MRI) scans, were available for either participant. The absence of such assessments do not represent a significant drawback, since the researcher ensured that both participants were bilingual adults with anomic aphasia as a sequela of a cerebral vascular accident by investigating the behaviour displayed by each participant. Such a behavioural approach is concerned more with what the client can or cannot do, and less with localizing his/her lesion and is in keeping with the cognitive neuropsychological endeavour in speech-language pathology.

Table 6. Timeline of activities associated with study.

Session Numbers	*Description of session*	*Stimuli/materials*
1-3	Receptive screening	Pictures and master word list
4-6	Baseline, pretreatment	Sesotho adaptation of the Western Aphasia Battery Sesotho adaptation of naming portion of Boston Naming Test. Selected portions of the PALPA adapted into Sesotho (Subtests 8, 9, 36, 45, 47, 48, 51. 53.1, 53.2, 53.3, 53.4, 53.5, 54.). Confrontation naming score (total of 80 words).
7-8	Treatment condition: 4: Codeswitching. Word list probed at conclusion of session 7	Word list allocated to condition.
9-10	Treatment condition 2: Initial phoneme cueing. Word list probed at conclusion of session 9	Word list allocated to condition.
11-12	Treatment condition 3: True phonemic cueing. Word list probed at conclusion of session 11	Word list allocated to condition.
13-14	Treatment condition 1: Prosodic cueing. Word list probed at conclusion of session 13	Word list allocated to condition.
15-17	Post treatment evaluation	Confrontation naming score (total of 80 words).
18	Follow-up; 1 month after conclusion of study	Confrontation naming score for both participant-specific word lists (80 items)

The following measures and steps were used to arrive at a diagnosis for each participant:

a. Adapted Sesotho versions of the Western Aphasia Battery (WAB) (Kersetz, 1982), the Boston Naming Test (Goodglass et al., 1983) were used as the evaluation tools. Only participants who presented with anomic aphasia as defined by the guidelines included in these batteries were eligible for inclusion. Though these tests proved to be problematic for reasons outlined in the Chapter 5, they provided an apposite starting point for determining the nature and extent of each participant's anomia.
b. The Psycholinguistic Assessment of Language Performance and Analysis (PALPA) (Kay et al., 1992) was used to shed light on the precise mechanisms and levels of deficit underlying each participant's anomia.
c. Clinical observations conducted by the researcher and a fellow speech-language pathologist over the course of six months of pre-study, routine speech-language pathology treatment provided an in-depth and accurate assessment of each participant's abilities, strengths and weaknesses. Speech samples for each participant were obtained during these sessions and used to inform assessment findings.
d. Clinical conferences were conducted with each participant's physicians and neurologists to ascertain the nature of the language disorder in each case.

Only participants who were bilingual speakers of Sesotho, as a first language, and English as a second language were eligible for inclusion. The status of each language was confirmed in a language history interview with the participants and their primary caregivers. This interview included questions on the age at which each language was acquired, the manner in which it was acquired (through home use or formal schooling), the current use of each language, the relative proficiencies of each language and literacy levels in each language (Paradis, 1987).

Since explorations of aphasia using the PALPA (Kay et al., 1992) may require participants to complete literacy based tasks, only individuals who had completed at least 12 years of formal schooling were eligible for inclusion in this study.

Moreover, a number of conditions and difficulties routinely associated with cerebral vascular accidents can act as extraneous variables in a study of this nature. In order to minimize the impact of such variables on the study results, the following measures were taken:

a. Participants with global aphasia as defined by the Western Aphasia Battery (Kertesz, 1982) were excluded, since a minimum ability to understand and participate in experimental tasks was a prerequisite for participation. Global aphasia is associated with severe comprehension and production difficulties, and is generally considered to be the most debilitating aphasic syndrome (Swindell et al., 1998). Participants with global aphasia would not have been able to participate satisfactorily in experimental tasks.

b. Participants with a hearing loss (defined here as a hearing loss associated with a pure tone average of 26 decibels and above) were excluded (Martin, 1997).

c. Participants with severe dysarthria /apraxia (as measured using the Robertson Dysarthria Profile) were excluded (Robertson and Thompson, 1986).

d. Participants with confirmed visual-perceptual deficits such as heminopia as evidenced by caregiver and/or medical reports were excluded.

e. Participants with cognitive impairments (as measured using the Mini-mental State Examination) (Folstein and McHugh, 1975) were excluded.

f. Participants with a history of developmental speech-language deficits as determined by self-reports or by primary care giver reports were excluded.

g. Participants were instructed to discontinue speech-language therapy for the duration of the study. Furthermore, all home-based therapy activities were suspended for the duration of the study.

Participant description

Interpreter

In order to counteract extraneous variables related to the second language status of the researcher, an interpreter was used as an aide during the research study. The interpreter was a first language speaker of Sesotho (as determined by a language history interview based on Paradis's (1987) guidelines) with an excellent command of English. The interpreter completed a four year university degree at a university where English is the main medium of instruction. The interpreter, a trained health worker, was employed within a rehabilitation setting, thus ensuring she was familiar with medical terminology relating to cerebrovascular accidents (CVA). The duties of the interpreter in this study were:

a. Adaptation of the WAB, BNT and the PALPA into Sesotho.
b. Adaptation of consent forms into Sesotho.
c. Education and counseling of the participant during the process of obtaining informed consent.
d. Rendering assistance during the language history interview.
e. Translation of word lists into Sesotho.
f. Provision of cues during Stage Two.
g. Rendering assistance, if and when, it was required during Stage Two.
h. Acting as a cross-cultural mediator between the researcher and participant.

Participant T

Biographical sketch of participant T

T. is a 42 year old male who attended once weekly speech-language therapy before the commencement of this study for about 6 months. T. resides in Sasolburg, about 70km south of Johannesburg. T. suffered a stroke in April of 2007, and was enrolled for speech therapy during the acute portion of his recovery in Metsimaholo District Hospital . T. speaks Sesotho as a first language, and English as second. He is post-morbidly functionally literate in both languages. Premorbidly he was employed as a security guard and driver for 20 years. He is fully ambulatory and independent for activities of daily living that do not require communication.

Medical diagnosis and associated information for participant T

T. was referred for speech-language therapy in December of 2007. The referring physician reported that he suffered a left sided CVA and presented with a fluent aphasia. During the acute phase of recovery, he suffered from a right sided hemiplegia which later remitted completely. No objective assessments of the locus of his lesion were undertaken but his symptoms (language disorders, decreased processing speed) seem to indicate a cerebral locus of insult. No significant basal ganglia or cerebellar signs were noted upon examination. T. is right handed.

General impression of language functioning in participant T

T.'s spontaneous speech is intelligible, with no evidence of motor speech involvement. He is able communicate using a wide range of complex structures. During speaking turns, he often experiences word finding difficulties. When such difficulties arise, T. may circumlocute or simply omit the target word. His wife reported that he experiences similar anomic rates in his spontaneous speech outside of a clinical setting. T. occasionally produces the initial phonemes of words during spontaneous conversations. A sampling of these circumlocutions and part-word productions is provided in Table 7. T. is able to understand a wide range of complex structures and is able to respond appropriately to such during his speaking turn. His ability to actively participate in English and Sesotho conversations speak to his intact receptive abilities.

Table 7. Circumlocutions and part-word productions produced by T. during baseline testing.

Target	*Translation*	*Production*
sefate	tree	"se-…sefa…"
tafula	table	"t…ta"
bohobe	bread	"boho…"
sethunya	gun	"s…sethu…"
katiba	hat	"ka…"
kgaba	spoon	"used for eating porridge"
kgwedi	moon	"in the sky at night"
tepu	spider	"lives on a web"
pelo	heart	"beating" (gesture: touches chest).
tlhapi	fish	"swims…" (gestures: makes waving motion with hand, mimicking fish swimming through sea).

During moments of anomia, T. will often use hand gestures to indicate the word he wishes to use but which is eluding him. These gestures appear to be far more than mimetic hand movements and have developed into a fairly complex, abstract set of manually-coded items. For example, T.'s gesture for dog consists of him patting his thigh with his palm (as one might do to show a dog that he is welcome to sit on your lap), the gesture used to represent 'coffee' is formed with the thumb touching the first and second finger of the hand with the third and fourth fingers spread out (similar to the hand position used to hold a steaming cup of coffee) while 'drink' is communicated by forming the hand into a fist and lifting it to the mouth and making a sipping sound. T. is able to complete tasks that revolve around the meanings of words such as identifying objects by their uses, or sorting pictures of objects into categories, some of which might are abstract (in one task, he was able to sort objects into man-made and natural objects). Furthermore, T. is able to write individual words during confrontation naming tasks at a much greater level of proficiency than his verbal production would suggest.

Formal testing of participant T

Sesotho adaptations of the Western Aphasia Battery (Kertesz, 1982), the Boston Naming

Test (Goodglass el al.,1983) and selected portions of the Psycholinguistic Assessment of Language Performance in Aphasia (PALPA) (Kay et al., 1992) were used to assess selected aspects of T.'s communicative function. As can be seen from Tables 8, 9 and 10. T. presents with largely intact communicative functions. However, during tasks which explicitly target lexical retrieval (such as confrontation naming), he displays distinct and manifest signs of naming dysfunction. The Aphasia Quotient obtained by T. during formal testing is consistent with a diagnosis of anomic aphasia.

Table 8. Scores obtained by participant T. on the subtests of a Sesotho adapted version of the Western Aphasia Battery.

Subtest	*Score*
Spontaneous Speech: Functional Content	5
Spontaneous Speech: Fluency	4
Spontaneous Speech Total	9
Comprehension: yes/no questions.	60
Comprehension: auditory word recognition	60
Comprehension: sequential commands	80
Comprehension Total: (scores divided by 20 as per manual)	10
Naming: Object Naming	18
Naming: Word Fluency	12
Naming: Sentence Completion	3
Naming: Responsive Speech	7
Naming Total:	4
Repetition:	10
Aphasia Quotient (AQ):	66

Table 9. Scores obtained by participant T. on a Sesotho adapted version of the Boston Naming Test.

	Participant T.
1. bed	CORRECT
2. tree	CORRECT
3. pencil	CORRECT
4. house	CORRECT
5. whistle	CORRECT
6. scissors	CORRECT
7. comb	INCORRECT
8. flower	CORRECT
9. saw	CORRECT
10. toothbrush	CORRECT
11. helicopter	CORRECT
12. broom	CORRECT
13. octopus	INCORRECT
14. mushroom	CORRECT
15. hanger	INCORRECT
16. wheelchair	INCORRECT
17. camel	INCORRECT
18. mask	INCORRECT
19. pretzel	INCORRECT
20. bench	INCORRECT
21. racquet	INCORRECT
22. snail	CORRECT
23. volcano	INCORRECT
24. seahorse	INCORRECT
25. dart	INCORRECT
26. canoe	INCORRECT
27. globe	INCORRECT
28. wreath	INCORRECT
29. beaver	INCORRECT
30. harmonica	INCORRECT
31. rhinoceros	INCORRECT
32. acorn	INCORRECT
33. igloo	INCORRECT
34. stilts	INCORRECT
35. dominoes	INCORRECT
36. cactus	INCORRECT
37. escalator	INCORRECT
38. harp	INCORRECT
39. hammock	INCORRECT
40. knocker	INCORRECT
41. pelican	INCORRECT
42. stethoscope	INCORRECT
43. pyramid	INCORRECT
44. muzzle	INCORRECT
45. unicorn	INCORRECT
46. funnel	INCORRECT
47. accordion	INCORRECT
48. noose	INCORRECT
49. asparagus	INCORRECT
50. compass	INCORRECT
51. latch	INCORRECT
52. tripod	INCORRECT
53. scroll	INCORRECT
54. tongs	INCORRECT
55. sphynx	INCORRECT
56. yoke	INCORRECT
57. trellis	INCORRECT
58. palette	INCORRECT
59. protractor	INCORRECT
60. abacus	INCORRECT
Total	13

Table 10. Scores obtained by participant T. on a Sesotho adapted version of selected subtests f the Psycholinguistic Assessment of Language Performance in Aphasia.

Subtest	*Score*
8. Repetition: Nonwords	28/30
8. Repetition: Nonwords reading	27/30
9. Repetition: Imageability and Frequency, high imageability words only	38/40
36. Oral Reading: Nonwords	21/24
45. Spelling to dictation: Nonwords	22/24
47. Spoken Word-Picture Matching	32/40
48. Written word- picture matching	34/40
53.1 Spoken Picture Naming	9/40
53.2 Written Naming	30/40
53.3 Oral reading	39/40
53.4 Repetition	38/40
53.5 Written spelling	35/40
54. Picture naming. High frequency Medium frequency Low frequency	 11/20 3/20 6/20

Psycholinguistic analysis of word retrieval abilities in participant T

Based on researcher interactions with T., and the use of adapted versions of formal tests, the presiding clinician diagnosed T. with classical anomia. Classical anomia is defined as an anomic syndrome which does not appear to be related to semantic or phonological deficits (Avila et al., 2001). Speakers with classical anomia tend not to produce semantic and/or phonological paraphasias; rather their errors consist primarily of omissions and circumlocutions based on the target items (Avila et al., 2001). Classical anomia is thought to occur because semantic activation of the phonological form is prevented in some way (Avila et al., 2001). Avila et al. (2001) argue that a weakened link between the semantic system and the phonological level is responsible for the symptoms of classical anomia. In T.'s particular case, it is hypothesized that the lemma does not send sufficient activation to the phonological nodes to optimally drive speech production, leading to the part-word productions, and circumlocutions noted in his spontaneous speech. These circumlocutions and part-word productions provide evidence for the view that the breakdown in naming occurs at the interface between the lemma and the phonological nodes; if the semantic-lemma link was impaired T.'s spontaneous speech would not feature part-word productions and circumlocutions. Clearly, lemmas in his mental lexicon must be sending some activation to their phonological nodes, or his speech would not feature fairly-accurate attempts to produce words.

T. appears to have intact semantic functioning. During speech-language therapy, he displayed the ability to complete tasks that revolve around the meanings of words such as identifying objects by their uses, or sorting pictures of objects into categories, some of which might be readily described as abstract (in one task, he was able to sort objects into man-made and natural objects). Moreover, his complex personal gestural system suggest relatively intact functioning at the semantic level. These findings are confirmed by the results which appear in Table 10. Tasks which require optimal functioning at the semantic level, but which do not compel T. to produce lexical items, such as spoken-word picture matching, or written word picture matching, or word semantic judgments, are all completed with relatively high levels of proficiency.

As can be seen from Table 10, T.'s word reading and writing abilities appear relatively typical. The model which underpins the PALPA, provided in Figure 2, helps to illustrate how it is possible for a client to have near-normal reading and writing abilities, in the face of naming dysfunction. It is important to note that in some respects this model is out of date. Current conceptualizations have abandoned the notion of input, output lexicons and buffers. They argue instead for the existence of nodes within the mental lexicon. Nonetheless, in terms of coarse grained detail, the PALPA model is thought to be a good approximation of word retrieval and can help clinicians to understand disparities between literacy skills and naming abilities. Figure 2 illustrates that many linguistic processes rely on an intact link between the semantic system (i.e. the semantic-conceptual store and lemmas collectively) and the phonological output lexicon (i.e. the phonological nodes). Some processes, such as word reading and writing, can occur without the participation of this link. Using the box-and-arrow analogy to chart a pathway, it is possible to get from 'print' or 'speech' as they appear at the top of the model to 'print' or 'speech' as they occur at the bottom of the model without traveling along the semantic system-phonological output lexicon link[4]. In essence, these abilities can occur in an extra-semantic fashion, and may not require the participation of the impaired link in T.'s word retrieval system. Similarly, repetition and nonsense word tasks are shown by Table 10 to be strengths in the case of T[5]. Again, such processes may not include the semantic system-phonological output lexicon link, and can be readily performed even in people with anomia.

Summary of word retrieval in T

T. suffers from classical anomia. The exact psycholinguistic mechanism and locus of breakdown during naming tasks may be described as follows:

a. When T. is shown a picture of an object, the semantic features associated with that object are activated. Nearby, related semantic bundles are inhibited. The relevant semantic features link to a lemma. Activation should flow from the semantic system to lemma and from the lemma to the phonological nodes.
b. However, in the case of T. insufficient activation flows from the lemma to the phonological nodes.
c. Limited phonological nodes come online; T. can produce some aspects related to phonetic form (initial phonemes) but there is too little overall activation to lead to normative word production.
d. When additional activation (in the form of a cue) is added to the residual activation, T. is usually able to produce the target word.

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[4] For example, if T. is asked to write the word *lehapu* the following pathway would underpin the task: auditory phonological analysis ➔phonological input buffer➔phonological input lexicon➔phonological output lexicon➔phonological output buffer➔sound to letter rules➔orthographic output buffer➔print. Similarly, the following pathway would be activated if T. was asked to read the word *lehapu:* print➔ abstract letter identification➔ letter to sound rules➔phonological output buffer➔speech

[5] Nonsense word tasks may make use of the acoustic to phonological conversion pathway which is distally located from the entire semantic system. Given that Sesotho orthography is almost completely regular, it may be possible for Sesotho speakers to use this pathway when completing tasks not involving nonsense words since all Sesotho words are read and written in regular ways (i.e. since nonsense words are usually regularly spelled, and Sesotho words are also regularly spelled, it may be possible to use the pathway used for processing nonsense words for processing normal Sesotho words).

Figure 3, which provides a hypothesized illustration of the levels of processing which are functional and dysfunctional within T.'s word retrieval system, illustrates weak activation flow between the lemma and phonological levels, and the consequent weak activation flow from the phonological level to the speech production apparatus (*Letata :* duck). Weak activation is denoted by arrows rendered with dashed lines.

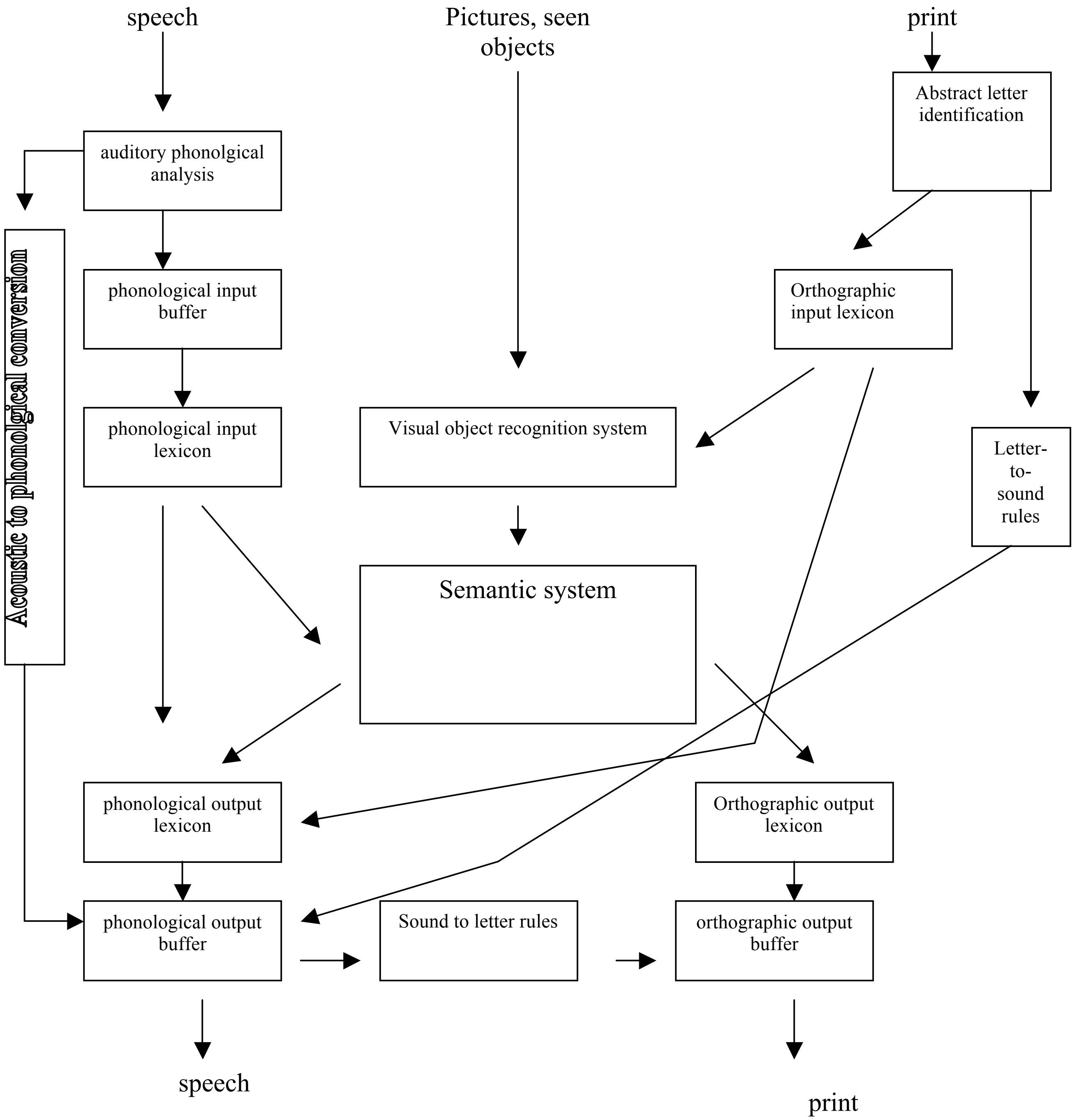

Figure 2. Word processing system as postulated by the developers of the PALPA.

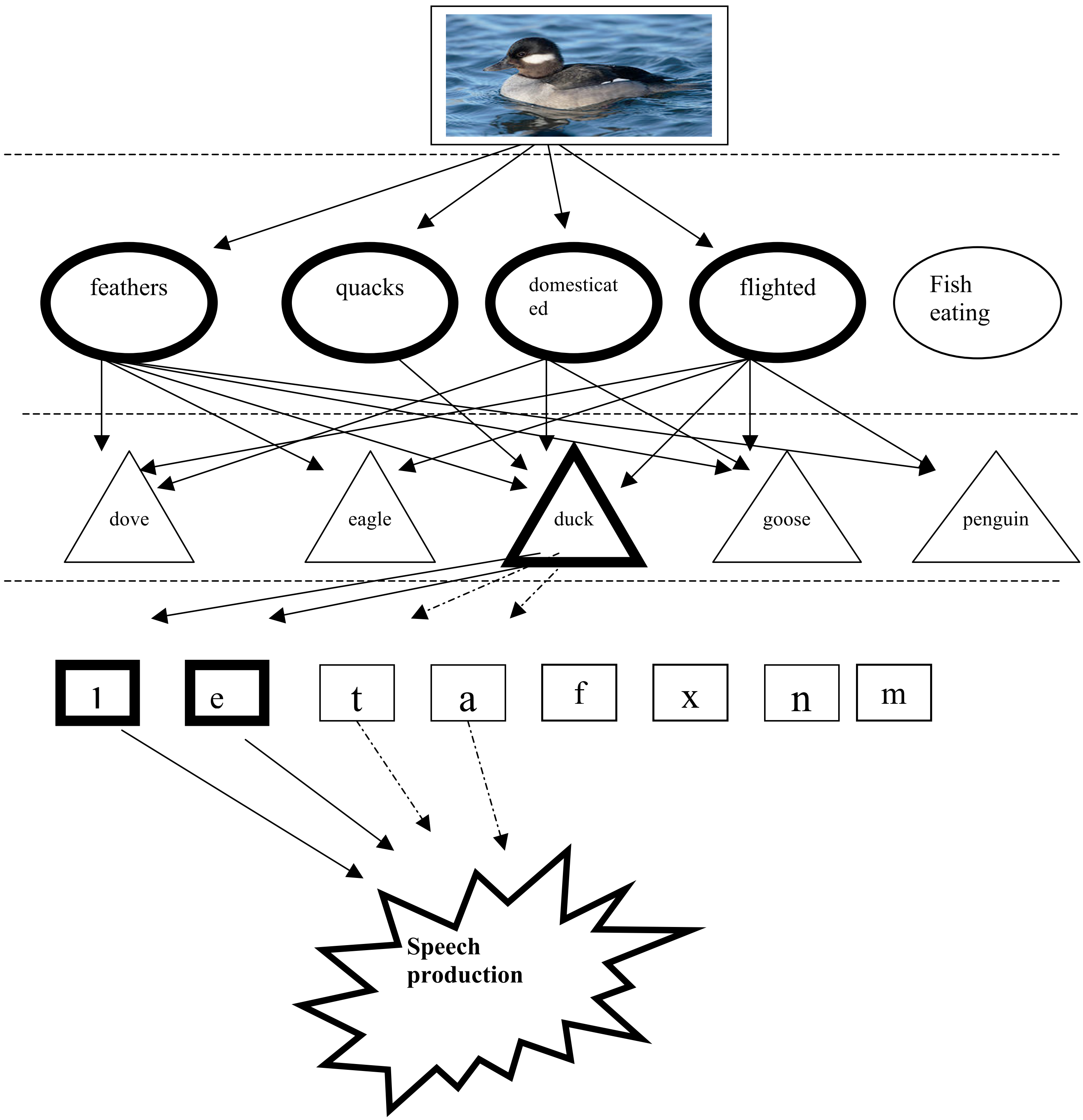

Figure 3. Hypothesized model of word retrieval in participant T.

Participant S

Biographical sketch of participant S

S. is a 32 year old female residing in Maokeng, the township attached to Kroonstad (about 200 km south of Johannesburg). She speaks Sesotho as a first language and English as a second. Her mother reports an excellent command of written Sesotho and English premorbidly, although S.'s written English was the less advanced of the two. She suffered a CVA at 27. Pre-morbidly she was employed as a primary level Sesotho teacher. She obtained her teaching diploma from a teachers' training college at 21. She is wheelchair-bound and independent for activities of daily living that do not require mobility. She commenced fortnightly speech-language therapy in April of 2007.

Medical diagnosis and associated information for participant S

S. was referred for speech-language therapy in March of 2008. The referring physician reported that she suffered a left sided CVA and presented with an expressive aphasia. Her symptom pattern has since changed and she today displays symptoms consistent with a fluent aphasia. During the acute phase of recovery, she suffered from a right sided hemiplegia. Today her right side is still much weaker than her left, and she relies on a wheelchair for limited mobility. No objective assessments of the locus of her neural lesion were undertaken but her symptoms (language disorders, decreased processing speed) seem to indicate a cerebral locus of insult. No significant basal ganglia or cerebellar signs were noted upon examination.

General impression of language functioning in participant S

S.'s speech is characterized by frequent pauses; one speech sample of 50 utterances featured an average of two anomic moments per clause. Paraphasias, predominantly of the semantic type, are also common. S. appears to have insight into her word finding deficit and will often attempt to correct paraphasias she produces during speaking turns. During anomic incidents, S. sometimes employs meaningless filler material ('ummm…') while searching for the target word. Soon after her CVA she developed the habit of circumlocuting in response to anomic moments. In the following example, she is trying to name a loaf of bread (translated from the original Sesotho):

"ummm…it's…it's …eating…you eat it…cut…ummm…knife…eat with…jam…"

Her ability to describe the semantic aspects of a target and a relatively intact ability to write names during naming tasks, reflect a (relatively) intact semantic level in her mental lexicon. Unimpaired semantic level functioning was confirmed with a number of activities such as picture matching exercises in which pictures are to be linked with their logical partners (e.g. match-candle; foot-shoe) and drawing of simple pictures to represent an auditorily presented word. S. was able to complete these and similar activities with relative proficiency while pure naming activities such as picture naming proved very difficult.

Formal testing of participant S

Sesotho adaptations of the Western Aphasia Battery (Kertesz, 1982), the Boston Naming Test (Goodglass el al.,1983) and selected portions of the Psycholinguistic Assessment of Language Performance in Aphasia (PALPA) (Kay et al., 1992) were used to assess selected aspects of S.'s communicative function. As can be seen from Tables 11, 12 and 13 S. presents with largely intact communicative functions. However, during tasks which explicitly target lexical retrieval (such as confrontation naming), she displays distinct and manifest signs of naming dysfunction. The Aphasia Quotient obtained by S. during formal testing is consistent with a diagnosis of anomic aphasia.

Psycholinguistic analysis of word retrieval abilities in participant S

Based on researcher interactions with S., and the use of adapted versions of formal tests, the residing clinician diagnosed S. with output anomia. Output anomia is defined as a pure word finding deficit (Maher and Raymer, 2004). Speakers with output anomia evidence intact semantic functioning and productive speech characterized by phonological or semantic paraphasias. In some instances, output anomia is thought to be linked to a failure to accurately specify a lemma from semantics. Anomia in such cases results not from the destruction of structures, or from weak links between structures, but from a breakdown in the indexing mechanisms of the storehouses of information that serve word retrieval (Kay et al., 1992). The storehouses (the semantic system and the phonological level nodes) are intact but the process by which words are looked up is impaired.

Table 11. Scores obtained by participant S. on the subtests of a Sesotho adapted version of the Western Aphasia Battery.

Subtest	*Score*
Spontaneous Speech: Functional Content	3
Spontaneous Speech: Fluency	2
Spontaneous Speech Total	5
Comprehension: yes/no questions.	50
Comprehension: auditory word recognition	50
Comprehension: sequential commands	60
Comprehension Total:	8
Naming: Object Naming	2
Naming: Word Fluency	3
Naming: Sentence Completion	1
Naming: Responsive Speech	4
Naming Total:	1
Repetition:	7
Aphasia Quotient (AQ):	42

In essence, some speakers with output anomia produce paraphasias because of a lack of inhibition at the level of the semantic system. In S.'s case, a picture stimulus leads to activation of the semantic-pragmatic bundles related to the picture. In unimpaired speakers, once the threshold of activation for a given word has been reached, close semantic neighbours are inhibited. Such inhibition is much weaker in some speakers with anomia and the lemmas of related words are brought online, leading to production of words related to the target.

S. appears to have intact semantic functioning. During speech-language therapy, she displayed the ability to complete tasks that revolve around the meanings of words such as picture matching exercises in which pictures are to be linked with their logical partners (e.g. match-candle; foot-shoe) and drawing of simple pictures to represent an auditorily presented word. These findings are confirmed by the results which appear in Table 13. Tasks which require optimal functioning at the semantic level, but which do not compel S. to produce lexical items, such as spoken-word picture matching, or written word picture matching are all completed with relatively high levels of proficiency.

As can be seen from Table 13, S.'s word reading and writing abilities appear relatively typical. The model which underpins the PALPA, provided in Figure 2, helps to illustrate how it is possible for a client to present with reading and writing ability, in the face of naming dysfunction. It is important to note that in some respects this model is out of date. Current conceptualizations have abandoned the notion of input, output lexicons and buffers. They argue instead for the existence of nodes within the mental lexicon. Nonetheless, in terms of coarse grained detail, the PALPA model is thought to be a good approximation of word retrieval and can help clinicians to understand disparities between literacy skills and naming abilities. Figure 2 illustrates that many linguistic processes rely on semantic system entries (in S.'s case, lemmas) which can be selected in a efficient fashion. Activation and inhibition should be finely balanced so as to ensure a compromise between activity and accurate naming performance. Some processes, such as word reading and writing, can occur without the participation of lemmas within the semantic system. Using the box-and-arrow analogy to chart a pathway, it is possible to get from 'print' or 'speech' as they appear at the top of the model to 'print' or 'speech' as they occur at the bottom of the model without traveling through the semantic system stopover (a more detailed description of these routes appears in the discussion relating to the psycholinguistics of S.'s word production deficits). In essence, these abilities can occur in an extra-semantic fashion, and may not require the participation of the impaired portion of S.'s word retrieval system. Similarly, repetition and nonsense word tasks are shown by Table 13 to be strengths in the case of S.

Summary of word retrieval in S

S. suffers from output anomia. The exact psycholinguistic mechanism and locus of breakdown during naming tasks may be described as follows:

a. When S. is shown a picture of an object, the semantic features associated with that object are activated. A host of bundles are brought online and send activation to a host of lemmas.

b. One of these lemmas is then selected.

c. The selected lemma sends activation to its nodes at the phonological level. If the lemma selected is linked to the target item, the correct word is produced. If the lemma selected is linked to a related form, a semantic paraphasia is produced.

Figure 4, which provides a hypothesized illustration of the levels of processing which are functional and dysfunctional within S.'s word retrieval system, illustrates a lack of inhibition at the lemma level, and the consequent production of semantic paraphasias. English words are used for considerations of space; the underlying concepts concerning word retrieval in English and Sesotho are believed to be virtually identical.

Table 12. Scores obtained by participant S. on a Sesotho adapted version of the Boston Naming Test.

	Participant S.
1. bed	CORRECT
2. tree	CORRECT
3. pencil	CORRECT
4. house	CORRECT
5. whistle	CORRECT
6. scissors	CORRECT
7. comb	CORRECT
8. flower	CORRECT
9. saw	INCORRECT
10. toothbrush	CORRECT
11. helicopter	INCORRECT
12. broom	INCORRECT
13. octopus	INCORRECT
14. mushroom	INCORRECT
15. hanger	INCORRECT
16. wheelchair	INCORRECT
17. camel	INCORRECT
18. mask	INCORRECT
19. pretzel	INCORRECT
20. bench	INCORRECT
21. racquet	INCORRECT
22. snail	CORRECT
23. volcano	INCORRECT
24. seahorse	INCORRECT
25. dart	INCORRECT
26. canoe	INCORRECT
27. globe	INCORRECT
28. wreath	INCORRECT
29. beaver	INCORRECT
30. harmonica	INCORRECT
31. rhinoceros	INCORRECT
32. acorn	INCORRECT
33. igloo	INCORRECT
34. stilts	INCORRECT
35. dominoes	INCORRECT
36. cactus	INCORRECT
37. escalator	INCORRECT
38. harp	INCORRECT
39. hammock	INCORRECT
40. knocker	INCORRECT
41. pelican	INCORRECT
42. stethoscope	INCORRECT
43. pyramid	INCORRECT
44. muzzle	INCORRECT
45. unicorn	INCORRECT
46. funnel	INCORRECT
47. accordion	INCORRECT
48. noose	INCORRECT
49. asparagus	INCORRECT
50. compass	INCORRECT
51. latch	INCORRECT
52. tripod	INCORRECT
53. scroll	INCORRECT
54. tongs	INCORRECT
55. sphynx	INCORRECT
56. yoke	INCORRECT
57. trellis	INCORRECT
58. palette	INCORRECT
59. protractor	INCORRECT
60. abacus	INCORRECT
Total	10

Table 13. Scores obtained by participant S. on a Sesotho adapted version of selected subtests f the Psycholinguistic Assessment of Language Performance in Aphasia .

Subtest	*Score*
8. Repetition: Nonwords	21/30
8. Repetition: Nonwords reading	25/30
9. Repetition: Imageability and Frequency, high imageability words only	35/40
36. Oral Reading: Nonwords	19/24
45. Spelling to dictation: Nonwords	20/24
47. Spoken Word-Picture Matching	27/40
48. Written word- picture matching	31/40
53.1 Spoken Picture Naming	5/40
53.2 Written Naming	25/40
53.3 Oral reading	38/40
53.4 Repetition	38/40
53.5 Written spelling	34/40
54. Picture naming. High frequency Medium frequency Low frequency	 4/20 2/20 1/20

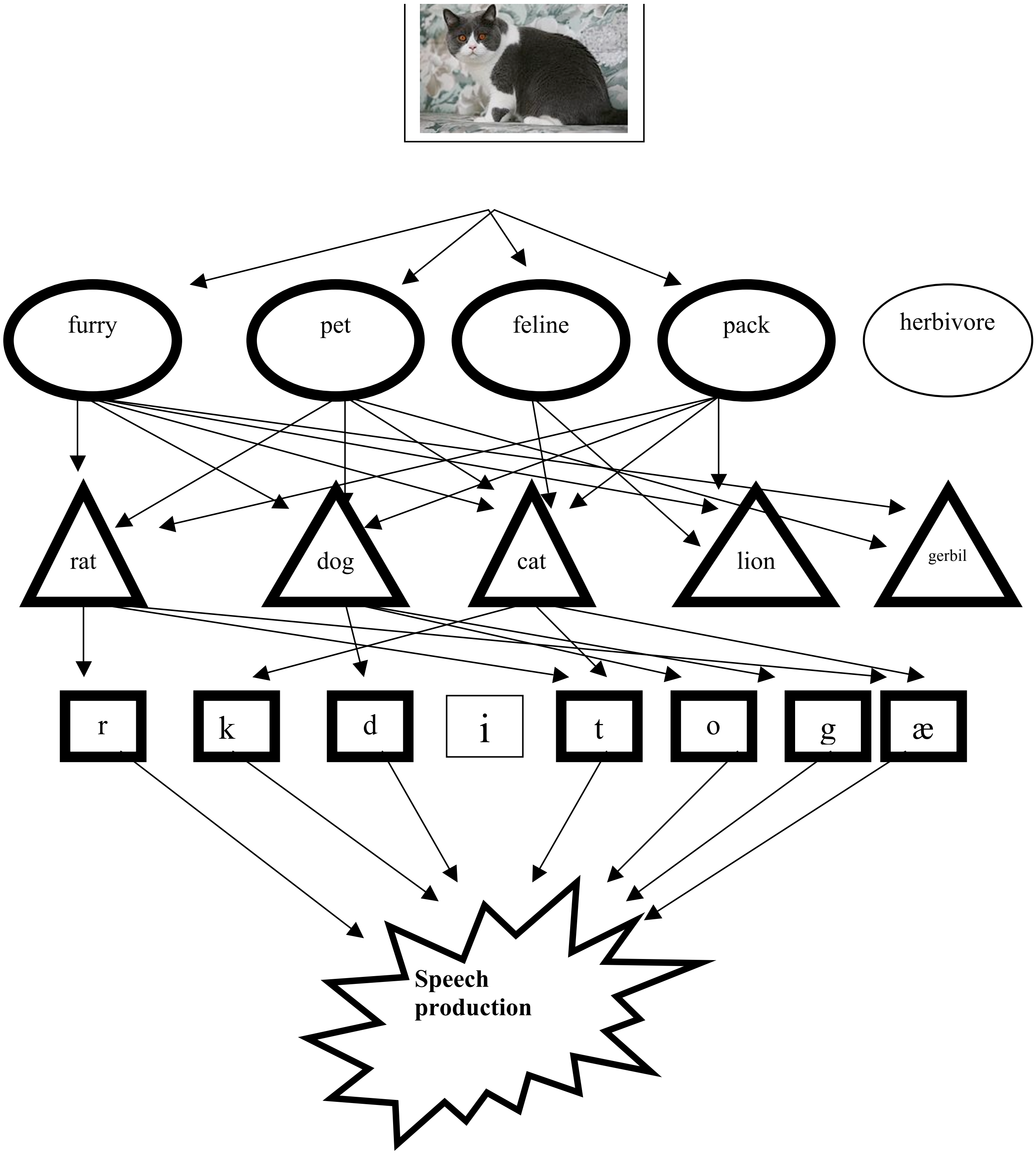

Figure 4. Hypothesized model of word retrieval in participant S.

Data collection

Each participant's responses were recorded on four response record sheets (1 response sheet for each condition). A sample of the response record appears in Figure 5. (All response records used in this study appear in the appendix). As can be seen, space is provided for recording pre-treatment scores on the treatment lists and semantically related lists, post-treatment scores on the treatment lists and semantically related lists, and follow-up scores for the treatment lists. Responses were coded according to the scheme used in Kiran and Roberts (2009). Totals for each error type associated with each condition were also entered on the response records.

The English translations provided in the response records may seem ambiguous, in respect of classifying words by semantic category (e.g. 'smile' in English may be a verb or a noun). Since verbs and nouns are more morphologically and semantically distinct in Sesotho, less ambiguity existed in the original Sesotho data. Where relevant, notations are provided to show what syntactic class the word belonged to in the original Sesotho.

Data analysis

The following constructs were used to gauge pre- and post- intervention naming abilities for the word lists used in both participants:

a. Overall cue potency: the degree to which a cue type empowers a participant to name words on a treatment list. A comparison of pre-- and post-testing naming performance based on the word lists allocated to the four conditions provided data relevant to this construct.

b. Semantic generalizability: the degree to which cue type empowers a participant to name words on a list semantically related to those on the treatment list. A comparison of pre- and post-testing naming performance based on the word lists allocated to the four conditions provided data relevant to this construct.

c. Persistence: the degree to which the positive effects of a cue type on naming abilities diminish over time. One month has been used as a time lapse for investigating priming in previous studies, and will also be employed here (DeDe et al., 2002). A comparison of naming performance based on the word lists allocated to each condition 1 month after the conclusion of the study provided data relevant to this construct.

For each participant, the following scores were obtained from the response records:

a. Pre-intervention scores for each of the treatment lists associated with each treatment condition (BODY PARTS assigned to the codeswitching condition, ANIMALS assigned to the initial phoneme cueing, FOOD AND DRINK assigned to the true phonemic cueing condition and HOUSEHOLD ARTIFACTS assigned to the prosodic cueing condition) as well as pre-intervention scores for each of the semantically-related lists associated with each treatment condition.
b. At the conclusion of the first session associated with any given treatment condition, a brief probe of the words on the treatment list was undertaken.
c. Post-intervention scores for each of the treatment lists associated with each treatment condition.
d. Post-intervention scores for each of the semantically-related lists associated with each treatment condition.
e. One month post-study scores for each of the treatment lists associated with each treatment condition.

Pre- and post-intervention scores were then compared for statistically significant differences. The scores obtained were used to render potency progression graphs, which show what relearning (if any) of words has occurred throughout the course of the study. For each condition, the number of positive and negative changes between pre- and post-test evaluations of naming ability were recorded.

The null hypothesis informing analysis of results was that any changes noted between pre- and post-test scores can be attributed to random change, while the alternative hypothesis was that such changes can be attributed to the intervention.

RESPONSE RECORD.

PARTICIPANT S; TREATMENT CONDITION 1 (CS)

WORD LIST: 'BODY PARTS'

Pre- treatment		*Post treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
neck (molala) NO RESPONSE	hair (moriri) SEMANTIC PARAPHASIA: 'shave'	neck (molala) SEMANTIC PARAPHASIA: ' 'swallow'	hair (moriri) SEMANTIC PARAPHASIA: 'shave'	neck (molala) NO RESPONSE
hand (letsoho) SEMANTIC PARAPHASIA: 'foot'	head (hlooho) CORRECT	hand (letsoho) SEMANTIC PARAPHASIA: 'glove, foot, shoe'	head (hlooho) CORRECT	hand (letsoho) SEMANTIC PARAPHASIA: 'foot'
bone (lesapo) NO RESPONSE	skull (lehata) NO RESPONSE	bone (lesapo) NO RESPONSE	skull (lehata) SEMANTIC PARAPHASIA: 'dead person, grave'	bone (lesapo) OTHER

Pre- treatment		*Post treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
finger (monwana) CORRECT	ear (tsebe) CORRECT	finger (monwana) CORRECT	ear (tsebe) CORRECT	finger (monwana) CORRECT
elbow (setswe) VOCALIZERS	nose (nko) VOCALIZER	elbow (setswe) SEMANTIC PARAPHASIA: 'bend'	nose (nko) VOCALIZER	elbow (setswe) VOCALIZER
foot (leoto) SEMANTIC PARAPHASIA: 'shoe'	ankle (leqaqalaina) OTHER	foot (leoto) SEMANTIC PARAPHASIA: 'walk'	ankle (leqaqalaina) SEMANTIC PARAPHASIA: 'toe' 'foot'	foot (leoto) NO RESPONSE
knee (lengole) NO RESPONSE	blood (madi) PHONEMIC PARAPHASIA: 'nati'	knee (lengole) NO RESPONSE	blood (madi) PHONEMIC PARAPHASIA: 'nati'	knee (lengole) NO RESPONSE
arm (sephaka) SEMANTIC	skin (letlalo) NO RESPONSE	arm (sephaka) NO RESPONSE	skin (letlalo) SEMANTIC	arm (sephaka) NO RESPONSE

Pre- treatment		*Post treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
PARAPHASIA: ‘ long’			PARAPHASIA: ‘black, white’	
TOTAL: NO RESPONSE: 4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: 4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT: 1	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA:1 SEMANTIC PARAPHASIA:1 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER:1 CORRECT: 3	TOTAL: NO RESPONSE: 3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT: 3	TOTAL: NO RESPONSE:0 PHONEMIC PARAPHASIA: 1 SEMANTIC PARAPHASIA: 5 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT: 3	TOTAL: NO RESPONSE: 5 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER:1 CORRECT:1

Figure 5. Response record sample.

The sign test was selected as the test for determining significance. This test was chosen for a number of reasons, Firstly, due to concerns relating to the validity of word lists, the number of stimuli used under each condition was necessarily small, and the sign test is ideally suited for use with small sample sizes (Dunn and Clark, 2009). Secondly, the sign test allows researchers to determine the probability that changes noted in participants can be ascribed to random variation (Dunn and Clark, 2009). In this instance, the sign test was used to measure this probability, and a low probability of changes being due to random variation, was taken as evidence for the alternative hypothesis. Since both very low and very high numbers of pre- to post-test changes will result in low probabilities of change due to random variation, only scores above 6 changes were considered as evidence of positive change due to the effects of the intervention.

This chapter has provided an overview of how this study was conducted, how data was gathered and how this data was analyzed. The next chapter discusses the results obtained using this methodology.

Chapter 5: Results

This chapter provides the results of this study. Two of the treatment conditions (initial phoneme cueing and codeswitch cueing) were not associated with statistically significant changes in naming performance, while two of the treatment conditions (true phonemic cueing and prosodic cueing) appeared to empower participants to relearn words targeted during therapy at statistically significant rates. None of the treatment conditions was linked to statistically significant amounts of semantic generalizability. Gains made during the intervention portion of this study appeared unchanged one month after the conclusion of the study. Explanations for these results, which are grounded in the CNP school, are offered.

Stage One (Stimuli development): The community-referenced approach

As outlined in Chapter 1, at the commencement of the study, in keeping with a number of other anomia studies, tests of naming were identified as possible assessments for use in this study. Given its ubiquity in anomia research, the Boston Naming Test (Goodglass et al., 1983) was chosen. In order to obtain a broader understanding of participants naming ability, the naming portion of the Western Aphasia Battery (Kertesz, 1982) was also selected as a possible test of naming ability for use in this study. Since the scope of the study was necessarily restricted to anomia as it occurs in bilingual speakers of English and Sesotho, two versions of the tests were used: the original English versions and an adapted Sesotho version (in the Sesotho version no initial attempt was made to adapt the tests to accommodate the cultural circumstances of the northern Free State).

As a starting point, the tests were administered to ten, neurologically normative Sesotho-English speaking adults living in the northern Free State. Within a short time, it became evident that commercially available evaluations of naming ability would not be suitable for use in the therapeutic portion of this study. A number of difficulties were identified.

Firstly, both tests examined proved to be statistically invalid. Validity is here defined as the degree to which evidence and theory support the interpretations of test scores (as entailed by proposed uses of tests)(American Educational Research Association, Psychological Association, & National Council on Measurement in Education, 1999), or the degree to which a test actually tests that which it sets out to test. In short, the researcher found that these tests do not probe naming abilities but some other, extraneous construct. This became clear when the tests were administered to functioning, independent, neurologically intact, literate adults during the pre-study phase. Bilingual speakers who were able to function well in both English and Sesotho (and a multitude of other languages) with no known history of neurological insult obtained results consistent (according to the test manuals) with anomia.

With these concerns in mind, the researcher set about devising alternative word lists for use in this study. Word lists and dictionaries were consulted for words. Initially, a large set of basic vocabulary items were selected and full colour pictures illustrating the words were obtained from various internet pictures banks. In order to ensure that all words fell within the cultural ambit of Sesotho speaking people living in the northern Free State, words were first pilot tested on the ten neurologically intact speakers. If a word was found to be difficult to name by two neurologically intact speakers (if the speaker was completely unable to name the picture, or took an inordinately long time to name the picture) it was removed from the set. By this process the 80 words used in this study were selected.

Having conducted a small-scale, informal pilot study using unimpaired speakers, the remaining words were then checked for various criteria based on previous anomia research to ensure minimization of extraneous variables related to the word list (explained in the *Methodology* section). Finally, the words were allocated into groups, which were balanced for various features. Each group was then allocated to a therapeutic condition and the word lists underpinned the intervention portion of this study.

A summary version of the method by which the word lists used in this study were developed is as follows:

a. Consult dictionaries and word lists for basic vocabulary (items that a speaker living in the northern Free State might encounter on a near-daily basis).

b. Produce or obtain pictures of the words selected.

c. Pilot test words on a group of manifestly unimpaired speakers. Words which appear to be difficult to name should be eliminated.

d. Depending on the nature of the study, devise a set of criteria to reduce the influence of extraneous variables related to the word list. Concerns that may need to be addressed at this stage include inclusion or exclusion of words based on syntactic class, imageability, phonetic complexity and phonetic length.

Stage Two (Intervention Study): Summary of results

In this study four cueing conditions were compared for clinical effectiveness using three commonly employed constructs. The conditions were a codeswitching condition (CS), an initial phoneme cueing condition (IPC), a true phoneme cueing condition (TPC) and a prosodic cueing conditions (PROS). The constructs used to measure efficacy were potency (the extent to which a given cue empowers a speaker to relearn items on a list, known as treatment lists), semantic generalizability (the extent to which a given cue empowers a speaker to relearn items semantically related to those explicitly targeted during intervention; semantically related items are placed on semantically related lists) and persistence (the degree to which gains in naming behaviour made during intervention persist over time). The relative efficacy of each of the four conditions as measured using the three constructs will be discussed below. Various previous studies of naming deficits have played a cardinal role in informing the following discussion. Early versions of the standard model of word retrieval (Kay et al., 1992; Kay and Ellis, 1987) (labeled 'coarse grained' by Wilshire (2008)) did not include concepts of nodes or spreading activation but nonetheless formed the foundation of the following analysis. Martin et al.'s (1999) comparison of two speakers with two different varieties of anomia, Raymer et al.'s(2000) analysis of lexical recovery in an individual with anomia and Thompson et al.'s (2006) analysis of naming behaviour in a patient with anomia all provided guidelines on how a coarse grained, nodeless model might be readily applied to a given speaker exhibiting a given range of behaviours. Avila, et al.'s (2001) study of the effect of priming on naming performance in a speaker with anomia informed the discussion about the success of cueing as a therapy technique and provided conceptualizations of activation summation. Hough's (2007) study of episodes of word retrieval failure and Wilshire's (2008) comprehensive overview of the current state of CNP models of word production supplied understandings of the interaction between a disordered activation-inhibition balance and clinical progress. Finally, Abel, Huber and Dell's (2009) application of concepts such as activation spread, nodes and the Editor to lexical disorders as they manifest in bilingual people played an important role in the interpretation of participant performance before and after intervention.

The following patterns emerged from the results of this study:

a. In both participants, codeswitching and initial phoneme cueing strategies were not associated with statistically significant growth in naming ability when using treatment lists as stimuli.
b. In both participants, true phonemic cueing and prosodic cueing were associated with statistically significant growth in naming ability when using treatment lists as stimuli.
c. In both participants, none of the treatment conditions were associated with statistically significant growth in naming ability when using semantically related lists as stimuli.
d. In both participants, very little deterioration of gains made during intervention was noted 4 weeks after the conclusion of intervention.

Stage Two (Intervention study): Overview of T's word retrieval abilities

T. presents with what has been termed 'classical anomia' (as defined by Avila et al., 2001), a naming difficulty thought to be related to dysfunction at the level of the connection between lemmas and their corresponding phonological nodes (Avila et al., 2001). Semantic level dysfunction was ruled out in T.'s case, since he displayed nuanced understanding of words' meanings, and was able to match auditorily presented labels to pictures at near normative levels (after Martin et al., 1999). Similarly, the links between the phonological nodes and the apparatus that drives speech itself (that portion of the system responsible for executing the motor programs of speech) were not implicated (after Avila et al., 2001). T.'s anomic symptoms occur because the relevant lemmas do not send sufficient activation to their phonological nodes, which in turn cannot yield activation to the structures which drive speech production (after Wilshire, 2008). The lemmas do send a limited amount of activation to the phonological nodes, which gives rise to the part word productions noted in T.'s spontaneous speech and the tip of the tongue phenomenon (similar in many respects to FR, the participant featured in Avila et al. (2001). This analysis was confirmed by the fact that T.'s naming performance was temporarily depressed when the clinician provided phonological miscues (these cues interacted with the remaining residual activation flowing from the lemma level and brought the incorrect phonological nodes online) (after Avila et al., 2001).

Potency in participant T

A potency progression chart for participant T. appears in Figure 6. Information obtained at various points in the study was used to produce Figure 6, which illustrates a general increase in naming ability over time for two of the treatment conditions (true phonemic cues and prosodic cues). The codeswitch and initial phoneme cue conditions were not associated with any significant growth in naming ability in participant T.

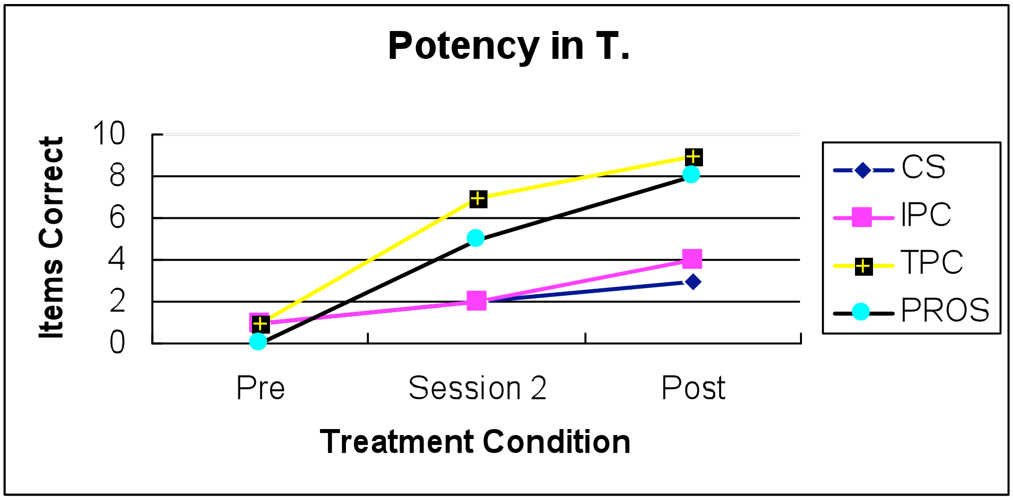

Figure 6. Potency progression raw scores for participant T.

Key:

CS: Codeswitch cue condition

IPC: Initial phoneme cue condition

TPC: True phoneme cues condition

PROS: Prosodic cue condition

Pre: Pre treatment scores on treatment list

Session 2: Score obtained on probe administered during second session allocated to a given condition on treatment list

Post: Post treatment scores on treatment list

Pre- and post-test scores obtained on all four treatment word lists were used to compile Figure 7. As can be seen in Figure 7, the greatest improvement across time (between pre- and post-intervention testing), is linked to the treatment conditions of true phonemic cueing and prosodic cueing. The remaining conditions (initial phoneme cueing and codeswitch cueing) were associated with very small improvements in naming ability.

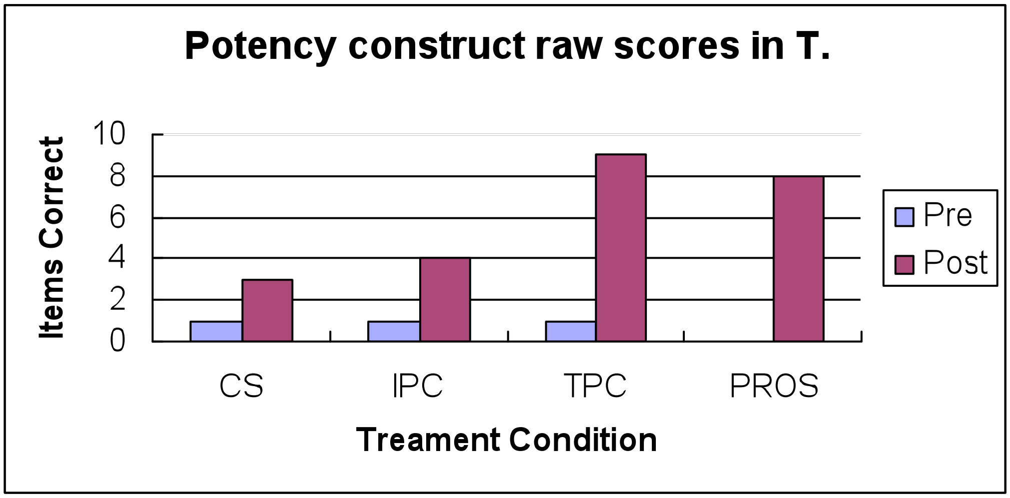

Figure 7. Potency construct raw scores for participant T.

Key:

CS: Codeswitch cue condition

IPC: Initial phoneme cue condition

TPC: True phoneme cues condition

PROS: Prosodic cue condition

Pre: Pre- treatment scores on treatment list

Post: Post treatment scores on treatment list

The data used to compile Figure 7 was used to produce Table 14, which provides information on the statistical significance of the changes noted for each condition. The sign test was used to ascertain probabilities of change due to random variation (*p=0.05)* and a distinct pattern emerged; while true phonemic cueing and prosodic cueing where associated with a large change, the remaining two conditions were not linked to noteworthy improvements in naming ability. In the case of the conditions associated with very little change, there was no evidence to suggest that the improvements in naming abilities noted were not due to normal, random fluctuation. However, in the case of the conditions in which a larger change was noted, the magnitude of the improvement in naming ability was such that it could not feasibly be attributed to natural variances in language abilities. It is argued that such changes are due to the treatment conditions themselves.

Table 14. Data relating to potency construct in participant T. across all four treatment conditions.

	Raw scores post-intervention	*Probability of obtaining scores due to random chance*	*Threshold for positive change due to intervention*	*Threshold reached?*
Codeswitch	3/10 (+2)	0.1719	6/10	No
IPC	4/10 (+2)	0.3770	6/10	No
TPC	9/10 (+8)	0.0107	6/10	Yes
PROS	8/10 (+8)	0.0547	6/10	Yes

Each of the conditions will be considered below, and possible explanations for the participant's performance under the four conditions will be offered. These explanations are based on current understandings of the word retrieval apparatus and should be seen as tentative, given the current underspecified nature of the models which inform research into the mental lexicon and the small sample size used in this study. In the instance of T., a possible explanation for varying rates of growth in naming ability makes recourse to the theory of activation summation as delineated by Avila et al. (2001). In his case, the most effective cues were those that complemented and supplanted the residual activation still flowing within the word retrieval system.

T's response to codeswitch cues in terms of potency

As can be seen from Figures 6 and 7 as well as Table 14, CS cues were not associated with significant growth in naming ability of words on the treatment list for participant T.

In order to elucidate the effect of CS cues, it is necessary to overview the activation pathway that a CS cue is hypothesized to follow in the mental lexicon of the multilingual speaker. Many theorists argue that, in the mental apparatus of multilingual speakers, L1 and L2 are linked at some level (e.g. de Groot (1992), Wei (2002), Edmonds and Kiran (2006)). The nature and extent of these links may vary, depending on the relative command the bilingual speaker has over L1, L2 or Ln (de Groot, 1992). Some theorists argue for links at the semantic level, advancing the view that L1 and L2 are served by the same conceptual store (Edmonds and Kiran, 2006). Others contend that L1 and L2 items may be linked at the lemma level, with L1 and L2 lemmas linked to one another (Kroll and Stewart, 1994). A very strong version of this position postulates that all the items from all the languages in a multilingual speaker's repertoire are stored in a single mental lexicon (Wei, 2002). Two possible activation pathways for CS cues, one of which appears in Figure 8, thus exist. In the first hypothesized pathway, a CS cue (i.e. the L2 version of the target word; if the target is *lehapu*, the cue would be 'watermelon') activates the lemma of this item at the L2 lemma level. Activation is then believed to spread to the shared conceptual store. From the conceptual store, at the semantic level, activation is yielded to the lemma nodes of L1 (Hough, 2007). The lemma nodes transmit activation to the phonological nodes pertinent to the target item and the process of speech production gets underway (Wilshire, 2008). In the second pathway, the L2 lemma node is activated and activation spreads directly to the L1 lemma, without passing through the semantic-conceptual store. The process from the lemma onwards is identical to that outlined in the first pathway. In this study, both positions were found to have explanatory power for results obtained and to be consistent with such results. The mechanism by which CS cues achieved (or failed to achieve) results can be explained by recourse to any theory which posit links between L1 and L2; the nature of the linkages between L1 and L2 is beyond to the scope of this study.

In the instance of T., it is hypothesized that CS cues failed to produce significant relearning results of the items on the treatment list because CS cues did not provide activation at the clinically relevant locus. Recall that T.'s anomic symptoms stem primarily from a weak link between the lemma and phonological levels; lemmas fail to send enough activation to their phonological counterparts to drive the process of normative, single word production (after Rose and Douglas, 2008). A CS cue provides activation which may spread to the point of breakdown in T.'s word retrieval system. However, a CS cue does nothing to bridge the gap which is the cause of T.'s anomic behaviour. Since a CS cue acts at a supra-phonological level (at the semantic and lemma levels), it does nothing to strengthen the transmission between the lemma and phonological nodes, which is the portion of the system that fails when T. is asked to complete a naming task.

Figure 8 illustrates the possible activation pathway associated with a CS cue in the context of T. attempting to name a picture. The results of this study seem to suggest that a codeswitch cue does not efficiently interact with T.'s residual processing abilities and does not help him to overcome a lack of activation flowing from the lemma level to the phonological level. L1 and L2 are represented as being linked at the semantic level.

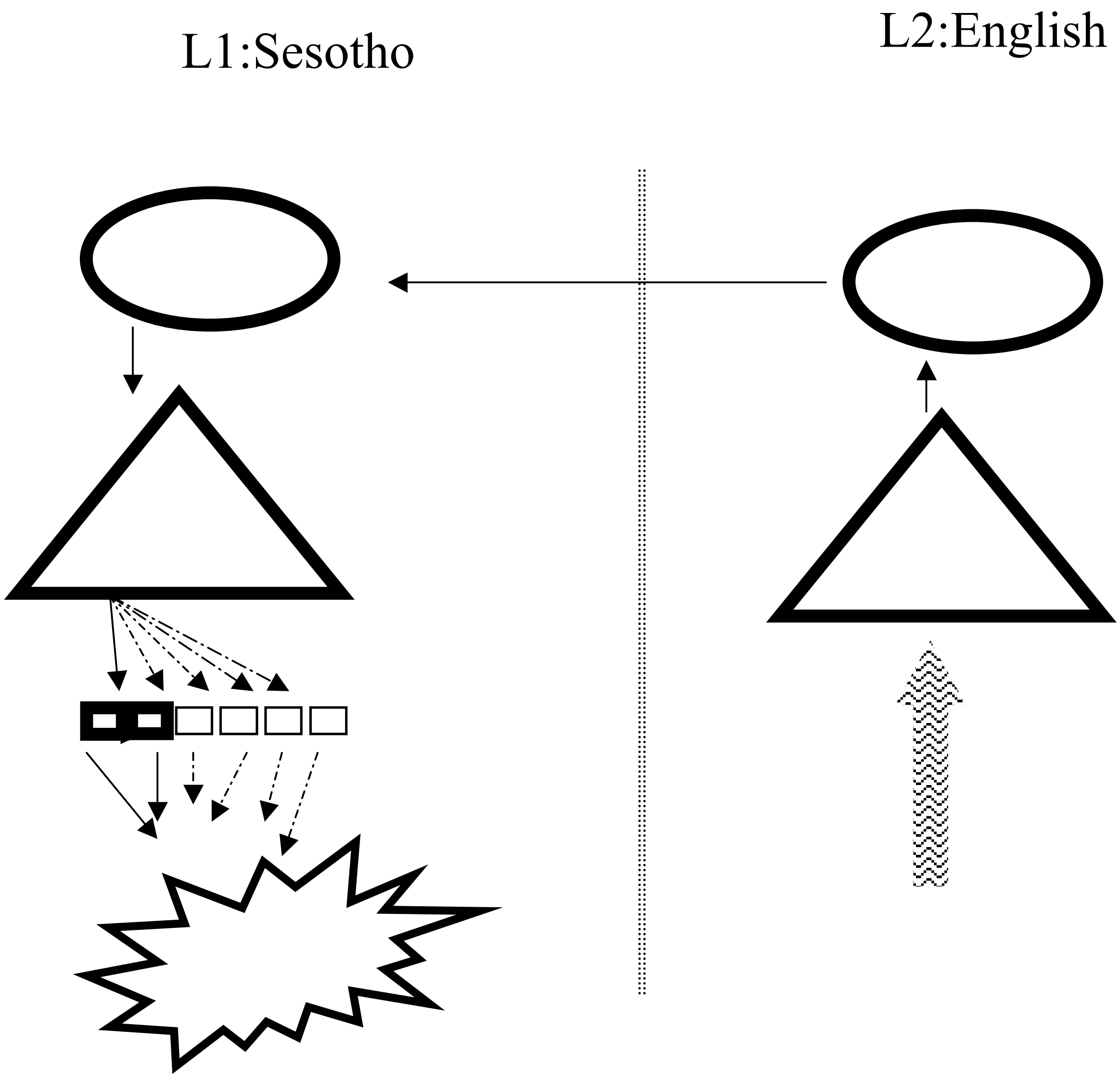

Figure 8. Hypothesized mechanism of codeswitch cue in T.

Activation spreads from the L2 lemma, via the concept store, or directly to the L1 lemma. The cue-engendered activation flow then encounters the same breakdown which impedes T.'s naming ability in other instances. The link between the lemmas and the phonological nodes is too weak to allow normal word retrieval (Hough, 2007) and the CS cue does nothing to address this difficulty. In short, the breakdown in transmission between the lexical and phonological levels in T.'s word retrieval system is not in anyway compensated for by CS cues. A proposed activation path to account for the effects of a CS cue on T.'s performance during the potency portion of this study would be (with ➔ representing activation flow between various levels and nodes): L2 lemma➔shared semantic-conceptual store➔L1 lemma…insufficient activation reaches the phonological nodes to drive speech production.

T's response to initial phoneme cues in terms of potency

As can be seen from Figures 6 and 7 as well as Table 13, IPC cues were not associated with significant growth in naming ability of words on the treatment list in T.

In the instance of T., it is hypothesized that IPC cues failed to produce significant relearning results of the items on the treatment list due to the same reasons that CS cues were largely ineffective. Figure 9 provides an illustration of the postulated mechanism of initial phoneme cues in the word retrieval system of T. In speakers of noun class languages, IPC cues are thought to provide activation at the lemma level, and in T.'s instance, such activation does not overcome the deficit which is responsible for his anomic symptoms. In noun class languages, such as Sesotho, most nouns can be divided into categories on the basis of their first syllable (Guma, 1971). The first syllable indicates the noun class and number of a given noun e.g. the word *lesapo* 'bone' belongs to the *le-ma* noun class and is a singular noun. Noun calls membership determines which quantifiers nouns may combine with in various circumstances (Doke and Mafokeng, 1974). In contrast to English, most nouns in Sesotho are characterized by an initial syllable that is a bound morpheme with semantic content (an indication of singular/plural status) (Guma, 1971). Such morphology is thought to be stored at the lemma level since it relates to how a word may or may not be used in combination with other words at the level of the sentence (after Wei, 2002). For T., an IPC cue is thought to produce activation at the lemma level which, for some as yet poorly understood reason, fails to transmit activation to the phonological level. An IPC, it seems, due to the nature of Sesotho morphology, has very little effect on the phonological level in T.'s word retrieval apparatus which in turn leads to the statistically insignificant benefits for naming performance noted. A proposed activation path to account for the effects of an IPC cue on T.'s performance during the potency portion of this study would be (with ➔ representing activation flow between various nodes): lemma of item➔… insufficient activation reaches the phonological nodes to drive speech production.

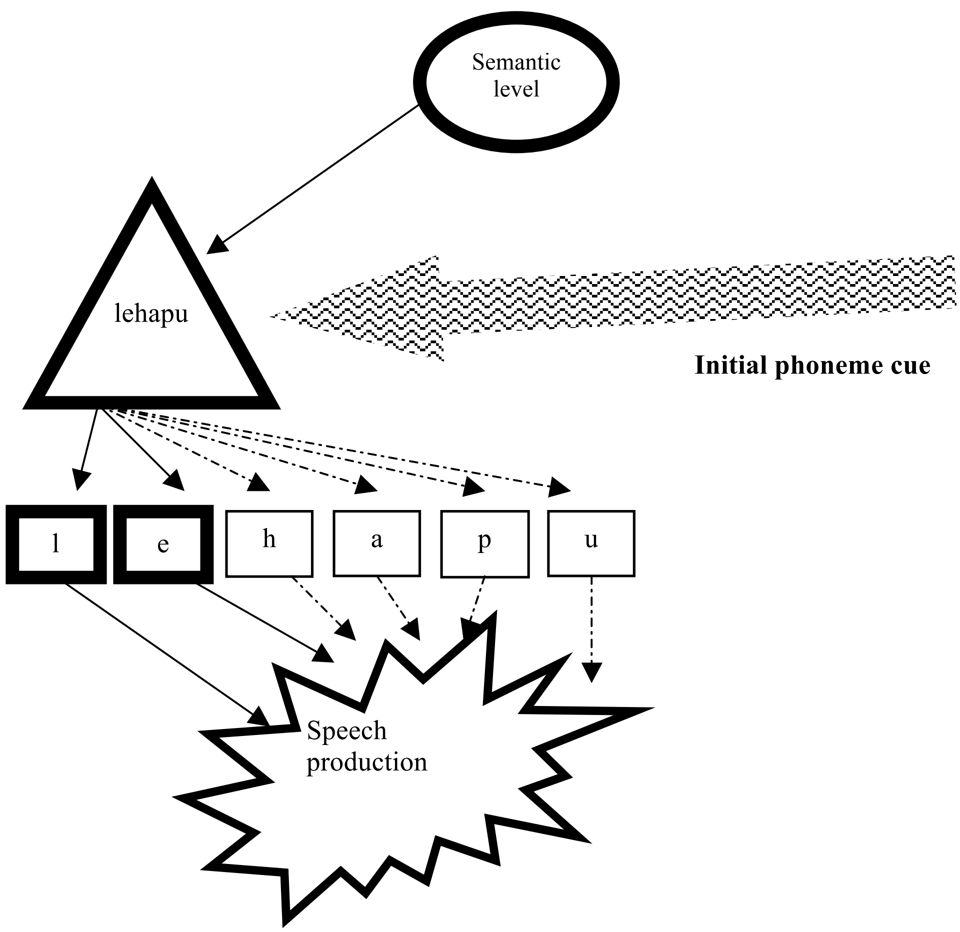

Figure 9. Hypothesized mechanism of initial phoneme cue in T

T's response to true phonemic cues in terms of potency

The TPC condition was linked to a significant improvement in naming performance in T, as evidenced by Figures 6 and 7 as well as Table 14.

The theory of activation summation may provide an explanation for the effectiveness of TPC in improving T.'s naming abilities for treatment lists. This conceptualization holds that in many impaired speakers, residual activation flows from one level to the next in the word retrieval system (Avila et al., 2001). In a simple word naming task, the lemma level will send activation to the phonological nodes connected to the lemma (Lambon Ralph et al., 2002). In some impaired speakers, this activation flow is not absent but simply weak or degraded. Residual activation is not sufficient to ensure that accurate naming takes place but may provide enough activation to various nodes in the word retrieval system to lead to partial word productions (Avila et al., 2001). In T.'s word retrieval system, residual activation is thought to flow from the lemma level to the phonological level. Such activation is enough to drive partial production of target words but is not great enough to result in target word production, leading to the symptom of part word productions, and omissions. Cues which supplant this residual activation, whose external activation is summed with the activation still extent in the system, have been shown to be highly effective at aiding relearning of words (Avila et al., 2001).

Figure 10 provides an illustration of the purported effects of TPCs on T.'s naming performance. A true phonemic cue is believed to provide external activation which interacts with the residual activation flowing from the lemma level to the phonological level. The summation of these two sources of activation is sufficient to drive the process of speech production.

TPCs may have been linked to a statistical improvement in naming ability because the activation they provided complimented that already present in T.'s naming system. By providing a cue based on the first morphologically meaningless sound in the word (i.e. a true phonemic cue), TPC provided activation at a locus which helped to compensate for T.'s breakdown. In this study, TPCs were equivalent to the initial phoneme cues which have become a staple of therapy for anomias caused by phonological level breakdowns in people who speak English (e.g. Maher and Raymer, 2004; Thompson et al., 2006). Such cues add to the activation flowing between levels and provide the phonological system with the activation needed to propel the speech production system (Avila et al., 2001).

The disparity between results obtained under the IPC and TPC conditions presents a dilemma. While an IP cue is believed to be primarily active at the lemma level, it does contain a phonological component.

When a speaker is cued for the word *dieta* 'shoes' with an initial phoneme cue (d-), the cue provides the speaker with information about the morphosyntactic aspects of the word (a plural noun belonging to the se- or other/ di- class). However, at the same time, this cue provides the speaker with some phonological information-the first phoneme of the actual word to be produced. Knowing this, before the commencement of the experiments which informed this study, a logical prediction would be that IPC and TPC would be effective at similar rates, given the fact that both sorts of cues provide some sort of phonological information. An answer to this quandary lies in an examination of T.'s pre-study evaluation as well as his pre-test responses for all treatment word lists.

In many instances, as evidenced by Table 10 and pre-study evaluations, T. had access to the first phoneme of words. The ability to correctly and accurately produce the first phoneme of a given word was a skill which was left largely unimpaired by the neurological insult linked to T.'s anomic symptoms. Thus, an IPC would have furnished T. with information already present in his word retrieval system, making it largely redundant. By contrast, TPCs were much more successful at boosting naming performance since they complimented the information flow already present in T.'s word retrieval system (Avila et al., 2001). This disparity of utility may help to explain why TPCs proved to be superior to IPCs in spite of both cue types offering some phonemic information.

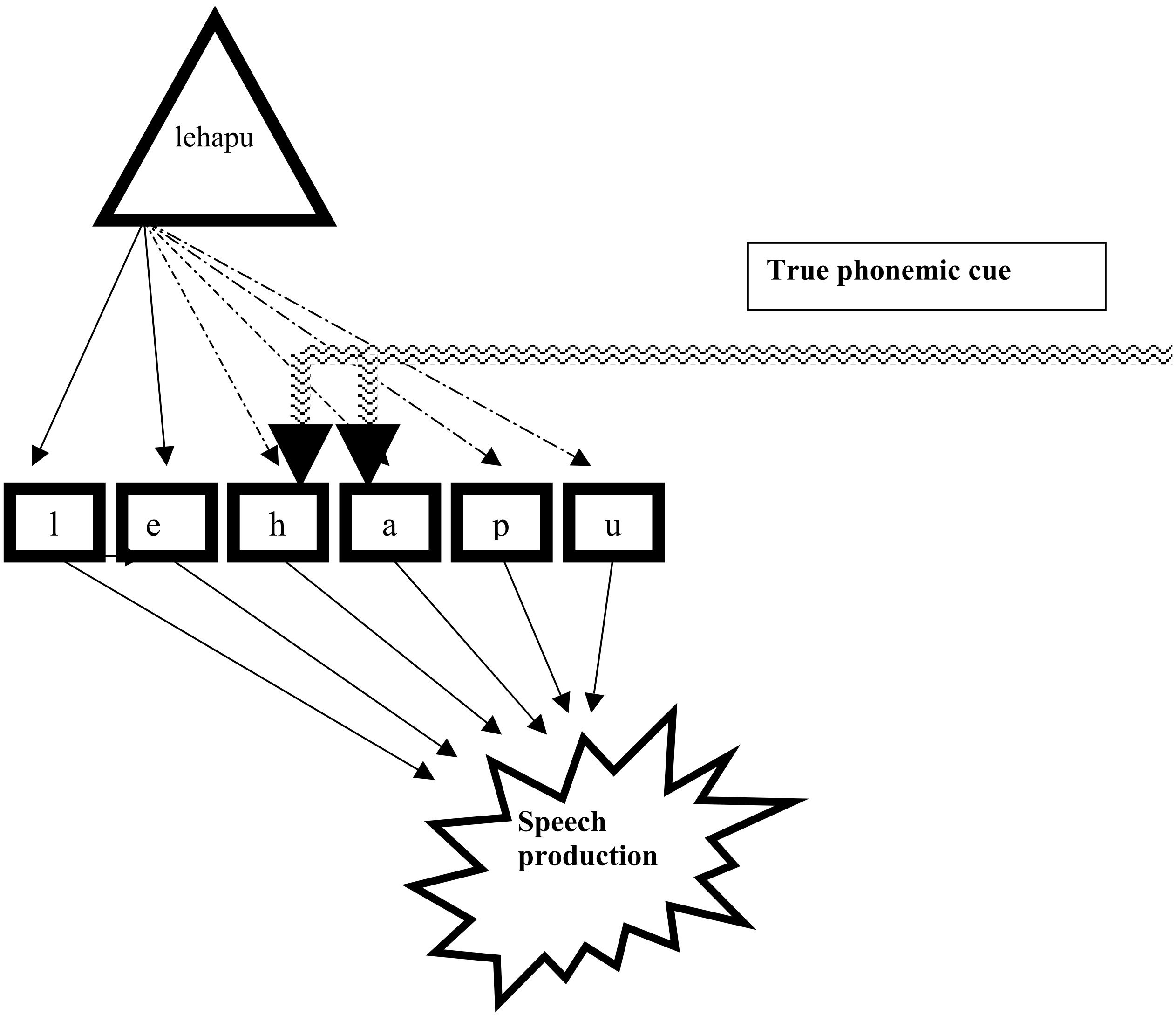

Figure 10. Hypothesized mechanism of true phonemic cue in T.

T's response to prosodic cues in terms of potency

According to Figures 6 and 7 as well as Table 14, prosodic cueing was the cueing condition associated with the greatest deal of potency as displayed by T.'s post-intervention naming ability for the relevant treatment list.

Though the prosodic cues were evidently the most successful at helping T. to relearn items on the treatment list, the standard spreading activation model of word retrieval which informs this study is currently too underspecified to offer definitive explanation as to why this is so. No consensus opinion exists as to how the model encodes suprasegmental aspects of speech with some authors arguing for explicit representation of individual syllables and others advancing the view that the suprasegmental aspects of word production are governed by rules applied at a post-phonological stage (Laganaro, 2008). Models commonly used in research at best discuss the issue of prosody in name retrieval in whispers (e.g. Lambon Ralph et al., 2000; Wei, 2002) and at worst are completely silent (e.g. Wilshire, 2008; Abel et al., 2009) as to how the prosodic profiles of words are derived. Use of prosodic-based techniques have featured in a few previous studies (Maher and Raymer, 2004) such as Leonard, Rochon and Laird's (2008) study of the use of phonological components analysis treatment (in this study, amongst other activities, participants were asked to generate and match syllable numbers for target words) (Leonard et al., 2008). Figure 11 provides an illustration of the interaction between the effect of the prosodic cues and the residual activation still extant in T.'s mental lexicon.

One possible refinement which may provide something of a partial explanation for the advantage prosodic cueing enjoys over the other conditions is that of a prosodic layer. In much the same way as the semantic, lexical and phonological layer are thought of as being composed of nodes, it may be the case that a post phonological layer, a prosodic layer, composed of prosodic nodes exists. At this layer, the exact locus of stress in a word would be specified and would transmit activation to the structures more proximally involved in actual speech production. The results of this study suggest that prosodic cues provide activation at some point very close to that at which speech programming takes place. This external activation, when summed with that currently extant within the word retrieval system, provides enough impetus to ensure that accurate naming takes place. The concept of the prosodic layer needs to be subjected to careful scrutiny and empirical investigation, but does provide a possible starting point for understanding how suprasegmental aspects of word production function within the speech system. Figure 12 provides an illustration of this proposed layer, and the way in which it is thought to interact with the residual activation still present in T.'s mental lexicon. At the word level, lehapu ('watermelon') is pronounced with a stressed second syllable; the first and third syllables are unstressed.

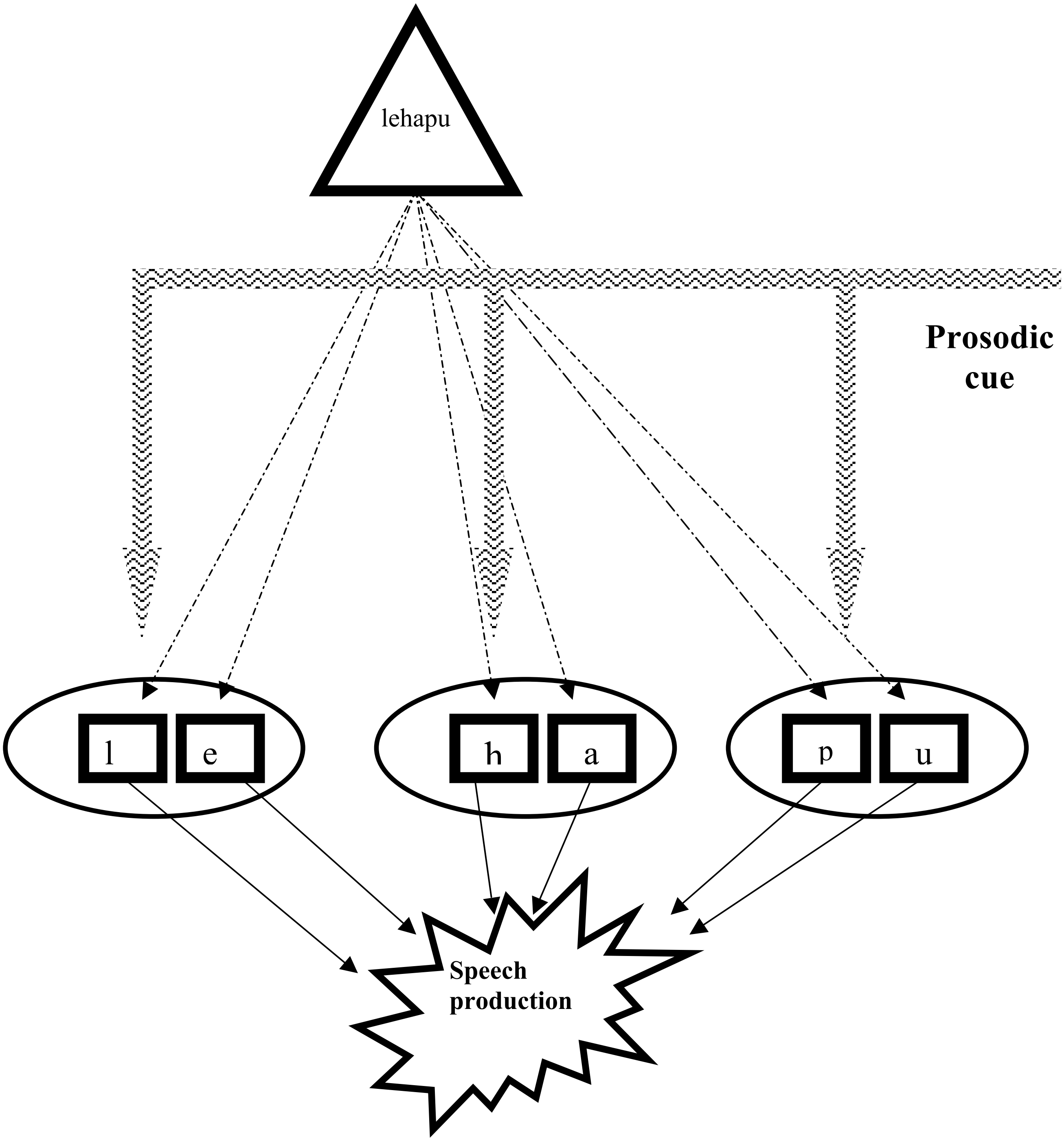

Figure 11. Hypothesized mechanism of prosodic cue in T.

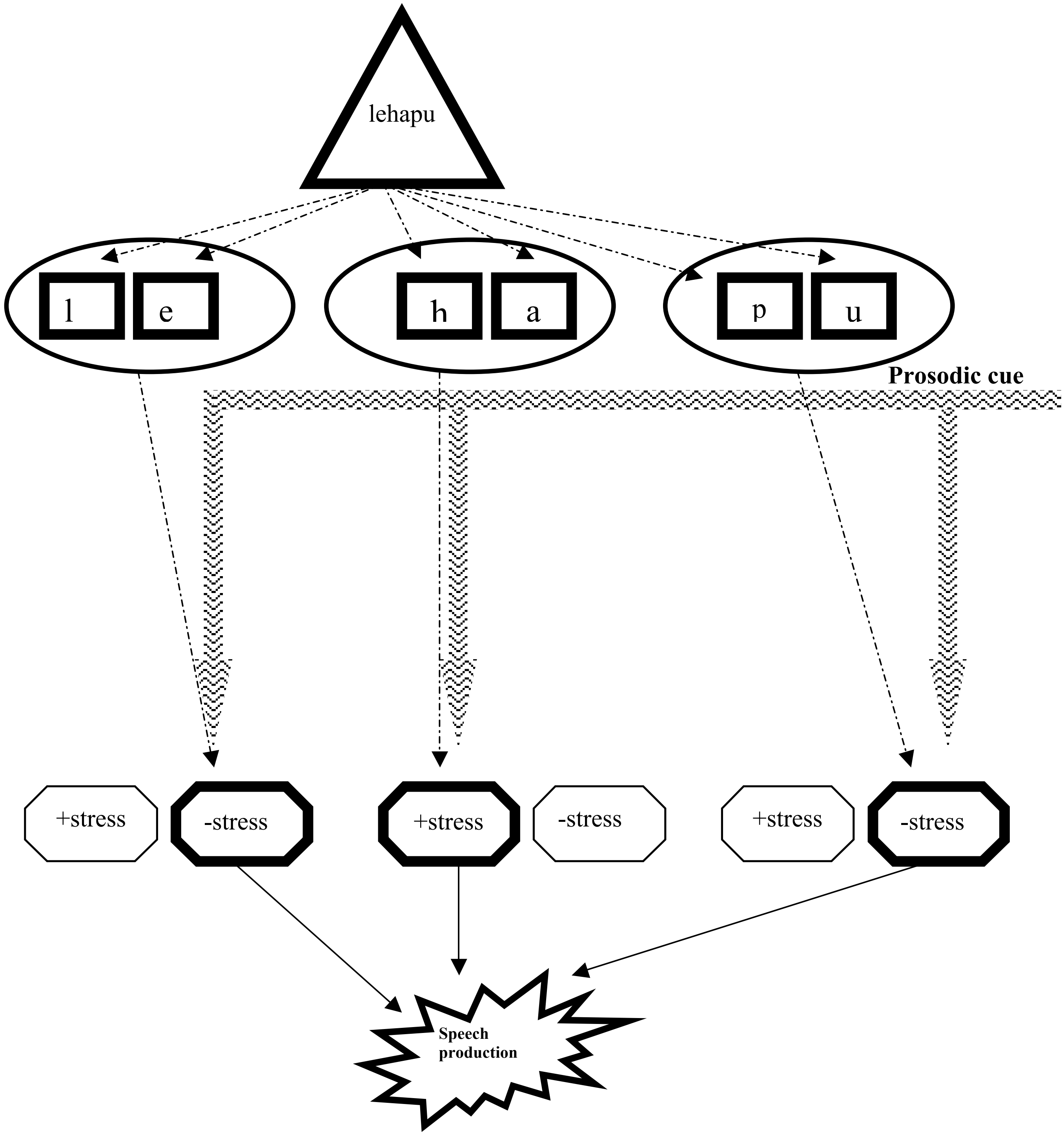

Figure 12. Hypothesized refinement illustrating prosodic layer.

Semantic generalizability in participant T

Pre- and post-test scores obtained on all four semantically-related word lists were used to compile Figure 13. As can be seen in Figure 13, for participant T., none of the treatment conditions was linked to a significant increase in ability to name items semantically related to those expressly targeted during intervention sessions.

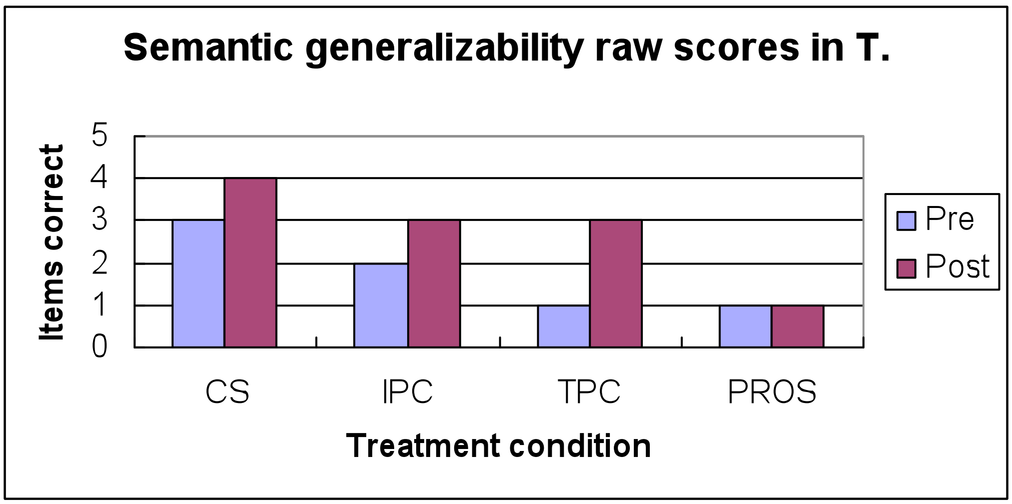

Figure 13. Raw scores for semantic generalizability construct for T.

Key:

CS: Codeswitch cue condition

IPC: Initial phoneme cue condition

TPC: True phoneme cues condition

PROS: Prosodic cue condition

Pre: Pre- treatment scores on semantically related list

Post: Post treatment scores on semantically related list

The data used to compile Figure 13 was used to produce Table 15, which provides information on the statistical significance of the changes (in terms of semantic generalizability) noted for each condition. Using the sign test to ascertain probabilities of change due to random variation (*p=0.05*), lead to the conclusion that none of the treatment conditions were associated with a statistically significant growth in the ability to name items semantically related to those directly addressed during the intervention portion of the study.

Table 15. Data relating to semantic generalizability construct in participant T. across all four treatment conditions.

	Raw scores post-intervention	*Probability of obtaining scores due to random chance*	*Threshold for positive change due to intervention*	*Threshold reached?*
Codeswitch	4/10 (+1)	0.377	6/10	No
IPC	3/10 (+1)	0.1719	6/10	No
TPC	3/10 (+2)	0.1719	6/10	No
PROS	1/10 (+0)	0.0107	6/10	No

When using CS cues, no semantic generalizability was noted since these cues do not address the gaps that exist in the word retrieval system. A codeswitch cue may provide activation which spreads up to the point of breakdown but does nothing to address the deficit. If the notion that L1 and L2 are somehow linked in the mental apparatus of multilingual speakers is taken as a given, then the activation pathway associated with a codeswitch cue in T. would possibly be as follows: L2 lemma➔shared semantic store➔L1 lemma➔… insufficient activation reaches the phonological nodes to drive speech production. As with the potency portion of this study, CS cues do not interact with the residual activation flowing from the lemma level to the phonological level. Even though they may lead to some sort of interaction between L2 and L1, they do not empower T. to produce any words, whether they appear on the treatment list, or the semantically related list.

In a similar vein, IPCs were not linked to semantic generalizability in T. The shortcomings of IPCs in terms of fostering semantic generalizability echo those of CS cues. IPCs are thought to generate activation at the lemma level in noun class languages, In these languages, the initial phonemes of the vast bulk of nouns derive from a small number of number and noun class marker prefixes. Since T.'s deficit is primarily due to a weak link between the lemma and phonological levels, and IPCs do not address this failing in any way, they were not associated with semantic generalizability.

TPC and PROS cues failed to lead to positive change in terms of semantic generalizability because the activation provided by such cues was not able to spread to levels of the word retrieval system where links between lemmas exist. A widely-accepted understanding of how items are indexed within various levels of the word retrieval system holds that semantic nodes (also called 'semantic features' in similar accounts) are stored at the semantic level, lemmas are stored at the lemma level and representation of phonemes are stored at the phonological level. Links exist between nodes at each of these levels (semantic features are arranged into semantic networks, lemmas into lemma networks, and phonological nodes into phonological networks). These levels are thought of as being related and linked. However, many argue that activation can flow in one direction only (semantic ➔lemma➔phonological). Since TPC and PROS cues are thought to induce activation at a post-lemma level (i.e. at the phonological level, usually placed 'below' the lemma level in models of word retrieval) (Avila et al., 2001), they do not activate the links between semantic neighbors at the semantic level or lemma levels, and thus do not have a positive effect on semantic generalizability. In essence, the activation provided by TPCs and PROS cues could not reach the level at which links between semantically related neighbours exist.

Stage Two (Intervention study): Overviews of S's word retrieval abilities

S. presents with what has been termed 'output anomia' (as defined by Maher and Raymer, 2004). Semantic functioning was found to be intact, since S. was able to correctly match heard words to pictures, and displayed a detailed knowledge of the meanings of words when such were evaluated using receptive methods (after Martin el al., 1999). Her difficulty is hypothesized to be the consequence of an indexing failure (after Kay et al., 1992). All node levels in the mental lexicon can be seen as storehouse, where elements are arranged systematically. Activation brings some of the items in a storehouse online and inhibition suppresses others (Hough, 2007). In S.'s case, there appears to be an imbalance between activation and inhibition at the lemma level. This results in a large number of candidate lemmas being active at the same time (after Wilshire, 2008). Because the system has no reliably accurate way of selecting which lemma to produce, one of the active lemmas is randomly selected (after Abel et al., 2009). This incorrect lemma selection leads to the semantic paraphasias evident in S.'s spontaneous speech. This analysis was confirmed when it was shown that semantic miscues had a marked impact on S.'s ability to accurately name pictures (such miscues provided more activation to the lemma level, a portion of the system already beleaguered by too much activation).

Potency in participant S

A potency progression chart for participant S. appears in Figure 14. Information obtained at various points in the study was used to produce Figure 14, which illustrates a general increase in naming ability over time for two of the treatment conditions (true phonemic cues and prosodic cues). The codeswitch and initial phoneme cue conditions were not associated with any significant growth in naming ability in participant S.

The data used to compile Figure 14. was used to produce Table 16, which provides information on the statistical significance of the changes noted for each condition. Using the sign test to ascertain probabilities of change due to random variation (*p=0.05),* lead to the emergence of a distinct pattern; while true phonemic cueing and prosodic cueing where associated with a large change, the remaining two conditions were not linked to noteworthy advancements in naming ability. In the case of the conditions associated with very little change, there was no evidence to suggest that the improvements in naming abilities noted were not due to normal fluctuation. However, in the case of the conditions in which a sizable change was noted, the magnitude of the improvement in naming ability was such that it could not feasibly be attributed to natural variances in language abilities. It is thus argued that such changes are due to the treatment conditions themselves.

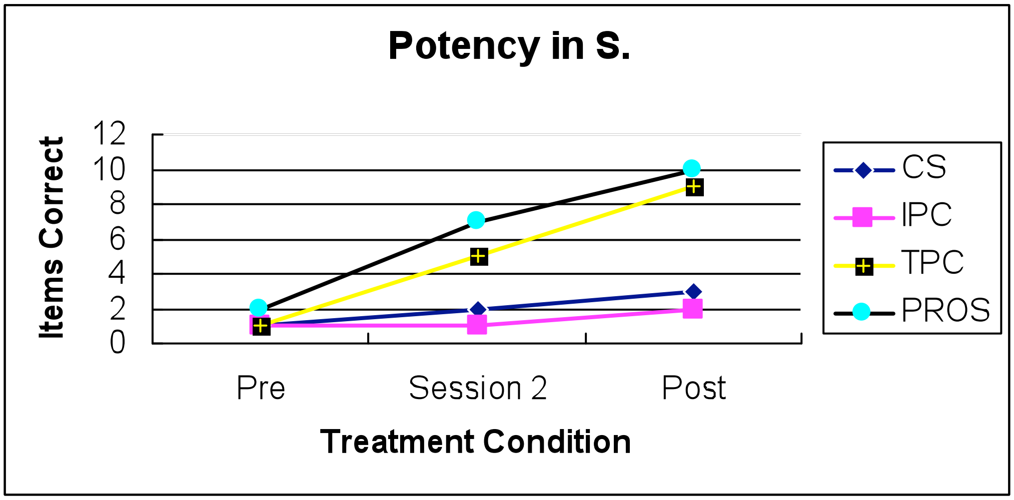

Figure 14. Potency progression raw scores for S.

Key:

CS: Codeswitch cue condition

IPC: Initial phoneme cue condition

TPC: True phoneme cues condition

PROS: Prosodic cue condition

Pre: Pre- treatment scores on treatment list

Session 2: Score obtained on probe administered during second session allocated to a given condition on treatment list

Post: Post treatment scores on treatment list

Pre- and post-test scores obtained on all four treatment word lists were used to compile Figure 15. As can be seen in Figure 15, the greatest improvement across time (between pre- and post-intervention testing), is linked to the treatment conditions of true phonemic cueing and prosodic cueing. The remaining conditions (initial phoneme cueing and codeswitch cueing) were associated with very small improvements in naming ability.

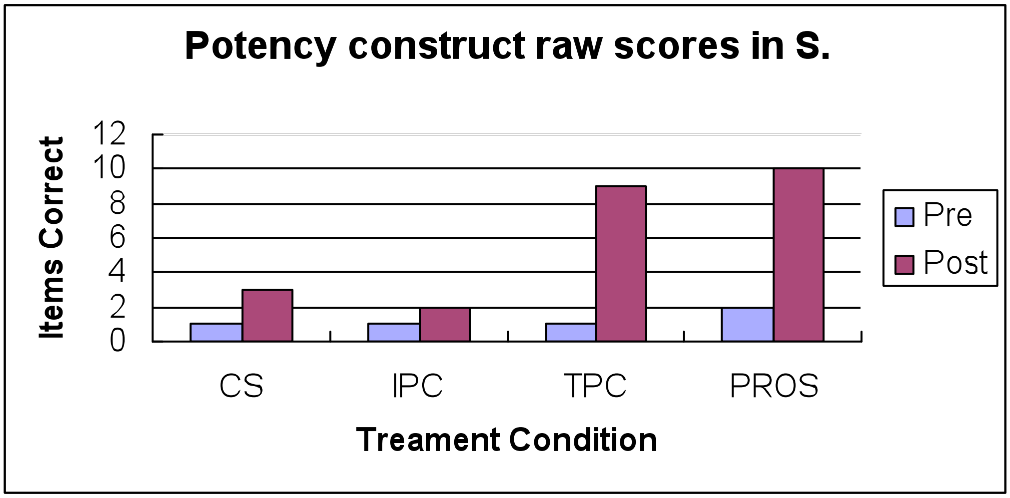

Figure 15. Potency construct raw scores for participant S.

Key:

CS: Codeswitch cue condition

IPC: Initial phoneme cue condition

TPC: True phoneme cues condition

PROS: Prosodic cue condition

Pre: Pre- treatment scores on treatment list

Post: Post treatment scores on treatment list

Table 16. Data relating to potency construct in participant S. across all four treatment conditions.

	Raw scores post-intervention	*Probability of obtaining scores due to random chance*	*Threshold for positive change due to intervention*	*Threshold reached?*
Codeswitch	3/10 (+2)	0.1719	6/10	No
IPC	2/10 (+1)	0.0547	6/10	No
TPC	9/10 (+8)	0.0107	6/10	Yes
PROS	10/10 (+8)	0.0010	6/10	Yes

S., in contrast to T, presents with an anomia thought to arise from an underlying inhibition deficit (after Hough, 2007). A cautious clarification as to why TPCs and PROS cues proved superior at helping her relearn words lies in arguing that these cues were better at eliminating competition between lemmas at the lemma level than the other two conditions (after Abel et al., 2009).

S's response to codeswitch cues in terms of potency

In the instance of S., it is hypothesized that CS cues failed to promote relearning of items on the treatment list because such cues may have exacerbated the underlying cause of her anomia. Recall that S.'s word retrieval failures are characterized by a lack of inhibition at the semantic level, giving rise to the symptom of frequent semantic paraphasias (after Abel, et al., 2009). Figure 16 illustrates this concept; widespread activation in the mental lexicon, denoted by heavy borders. When a CS cue is provided to S. during a naming task, the activation spreads from the L2 lemma to the L1 lemma. A CS cue would lead to a large number of L1 lemmas coming online. In other speakers, the normal inhibitory process would prevent irrelevant lemmas from transmitting activation to the phonological level, with only the most activated lemma yielding activation to the phonological level, ensuring an accurate naming performance (Wilshire, 2008). In S.'s case, by contrast, such inhibition is weak, and a CS cue may simply provide too much activation at the level of the L1 lemmas to be useful. Excess activation, the sum of the activation derived from the cue and S.'s systemic lack of inhibition, would lead to excessive competition at the lemma level. In such instances, semantic paraphasias would continue to occur or occur at an even greater rate. This idea is born out by the data presented in Table 17, which lists the number of semantic paraphasias of each error produced by S. under various treatment conditions at various points in the study. In short, CS cues do not help S. to relearn items on a treatment list because they increase rather than decreases inhibition in the word retrieval system.

Table 17. Semantic paraphasias produced by S., when performing confrontation naming tasks under all four treatment conditions.

Treatment condition	*Treatment List*		*Semantically Related list*	
	Pre-intervention	*Post-intervention*	*Pre-intervention*	*Post-intervention*
Codeswitch cues	4	4	1	5
Initial phoneme cues	4	4	2	6
True phonemic cues	5	0	4	2
Prosodic cues	4	0	3	3

An obvious query at this juncture relates to rates of semantic paraphasias. If, in the word retrieval system of S., CS cues lead to increased competition amongst lemmas, why are CS cues not more robustly linked to increased rates of semantic paraphasia? The answer to this seeming conundrum may lie in postulating an additional structure which oversees the entire process of word retrieval named 'the Editor' by some authors (Abel et al., 2009). The Editor is that portion of the word retrieval system which exercises executive control over the process, judging the accuracy of the final results produced and rejecting or accepting the final product according to the demands of the task (after Abel et al., 2009). In the case of S., it may be that her Editor is relatively intact, and this enables her to reject some of the competitors at the lemma level, or at least to have a sense of the accuracy of potential candidates. The Editor is not powerful enough to drive the system of word retrieval such that the target word is retrieved but does have the ability to exercise a moderate oversight role (Abel et al., 2009). It is this oversight which may prevent S. from displaying an increased incidence of semantic paraphasia during certain naming tasks. During pre-study evaluations, S. would often make remarks concerning the accuracy of her choices during word retrieval tasks. She was reflecting on how accurate her attempts to name pictures were, and this reflection is the function of the Editor; the Editor tries to adjudicate how near to target a word is. S. clearly has a functional Editor, as evidenced by these remarks.

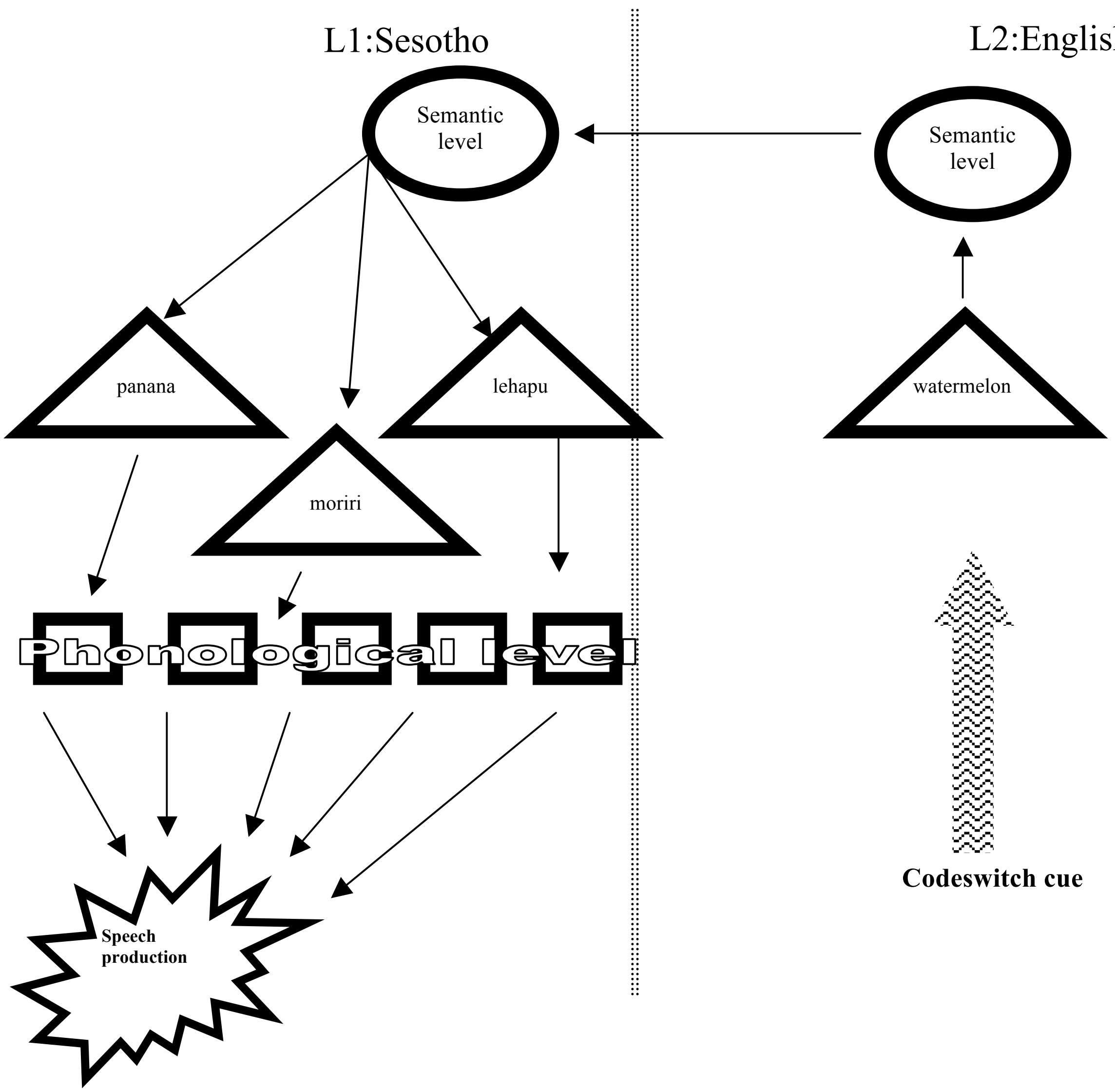

Figure 16. Hypothesized mechanism of codeswitch cue on S.'s word retrieval system.

S's response to initial phoneme cues in terms of potency

S.'s performance in terms of naming items on the treatment list allocated to the IPC condition did not improve significantly over the course of the study. A possible reason for this lack of growth in naming ability may relate to S.'s indexing deficit. According to psycholinguistic models of word retrieval, storehouses within the system may display indexing breakdowns; items cannot be looked up in a normative fashion (Kay et al., 1992). S.'s lack of inhibition at the semantic and lemma levels amounts to an indexing deficit since it impedes the system's ability to select items at these levels. In her instance, a cue which provides a clear indication of the target lemma would help to overcome the activation overload. When S.'s is shown a picture of a foot (*leoto*) during a naming task, lemmas relating to a wide variety of body parts are thought to come online due to impaired inhibition (*molala* 'neck' *letsoho* 'hand' *leino* 'tooth' *lesapo* 'bone' *lengole* 'knee' *leleme* 'tongue' *sephaka* 'arm'). An IPC (in this particular instance /l/) does not provide an unambiguous signal as to the relevant lemma, since the bulk of the candidates have /l/ as their initial phoneme. As was discussed in the Chapter 3, the number of initial phonemes possible for nouns in Sesotho is exceptionally small. The majority of nouns start with just one of six phonemes namely /m/, /b/, /l/, /s/, /d/ and /n/ (Mokoena, 1998). Given this fact about the intersection between phonology and morphosyntax in Sesotho, IPC cues do amount to an efficient method of eliminating or even reducing competition between lemmas. Figure 17 provides an illustration of the proposed effects of IPC cues on S.'s word retrieval system. Notice widespread activation in the mental lexicon, denoted by heavy borders.

Furrthermore, IP cues may have provided additional activation to a system already plagued by excess activation. Due to the morphosyntactic nature of Sesotho outlined previously, an IP cue amounts to a lemma level cue. S.'s word retrieval system is impaired because of a lack on inhibition at the semantic and lemma levels. An IP cue provides activation at a point where there is already too much activation for the process of word retrieval to proceed smoothly. Excess activation leads to increased competition at the lemma level which in turn leads to the low rates of word relearning linked to this cueing condition (Wilshire, 2008). Again, the intervention of some sort of overarching decision-making structure, or Editor, may help to explain why semantic paraphasia rates did not seem to increase under the influence of IP cues during the potency portion of this study.

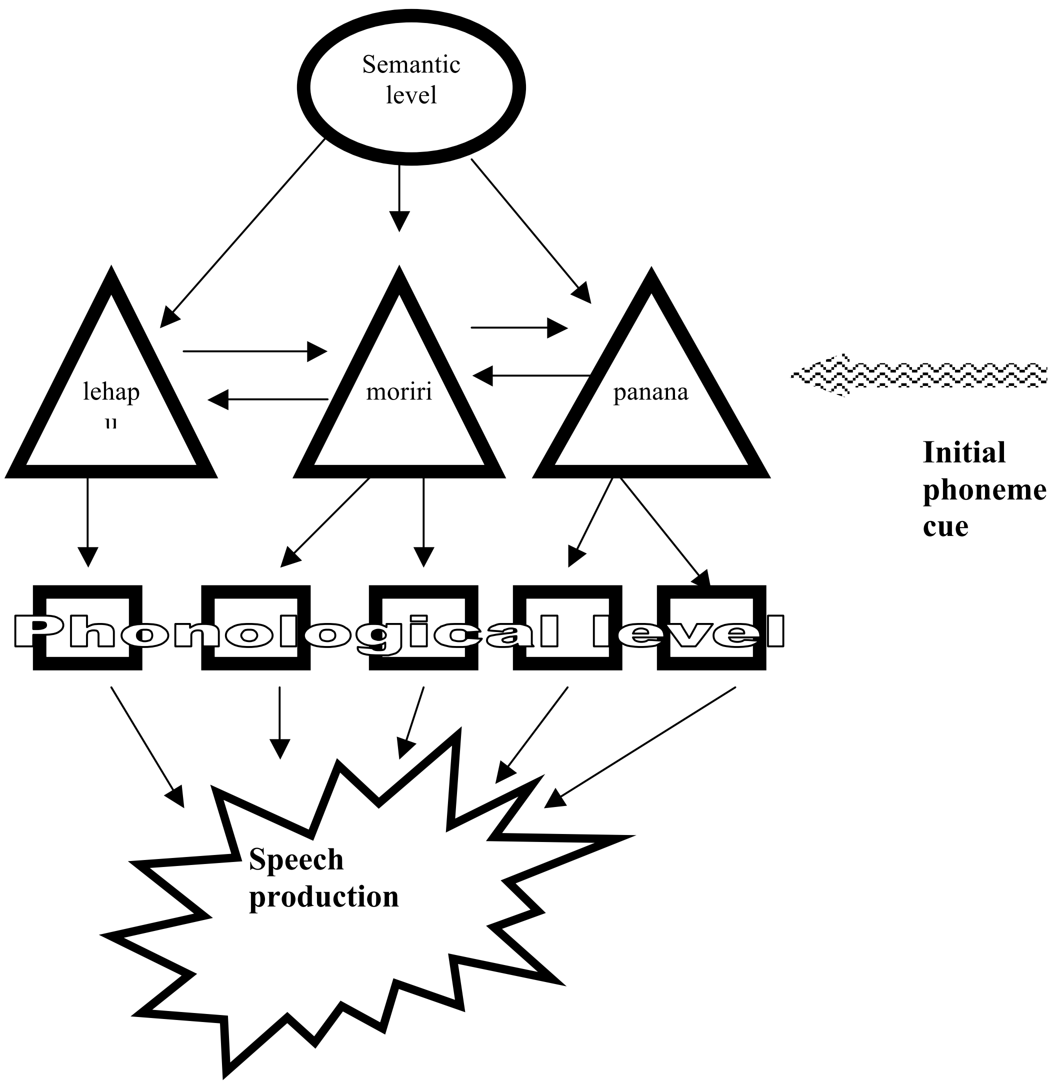

Figure 17. Hypothesized mechanism of initial phoneme cue on S.'s word retrieval system.

S's response to true phonemic cues in terms of potency

In participant S., word lists relearned under the TPC conditions showed a statistically significant improvement after intervention. It is hypothesized that TPCs were successful at helping S. to relearn words of the relevant treatment list because they helped to combat the effects of her inhibitory deficit. It is postulated that TPCs amount to valuable pointers to the target lemma at the lemma level. If the situation discussed earlier is considered {S.'s is shown a picture of a foot (*leoto*) during a naming task and a wide variety of lemmas relating to a wide variety of body parts are thought to come online due to impaired inhibition (*molala* 'neck' *letsoho* 'hand' *leino* 'tooth' *lesapo* 'bone' *lengole* 'knee' *leleme* 'tongue' *sephaka* 'arm')}, it becomes evident that a TPC provides an explicit indicator as to the target lemma since the number of possible initial phonemes in uninflected Sesotho words is much higher than the number of initial phonemes shared by the noun class markers. Uninflected nouns can have any of the 23 phonemes of Sesotho as their initial sound (Mokoena, 1998), so a cue based on the uninflected form of a word gives a specific suggestion as to the correct lemma. In essence, true phonemes are more unique, and thus better specifiers of which lemma to bring online, than morphological markers.

It is important to bear in mind that S.'s word retrieval system is not moribund in that activity takes place at various junctures in the system. Residual activation flows down through the various node levels, and the Editor keeps overall control over the process of naming (Abel et al., 2009). This allows a certain amount of feedback in the system (Abel et al., 2009). Even though TPCs are thought to act primarily at the phonological level, it is this feedback which allows the system to select a lemma based on activation occurring at a post lemma level.

S's response to prosodic cues in terms of potency

Data was accrued during post-intervention testing of S., who also showed the greatest improvement in naming under the prosodic cueing condition. The same factors which ensured prosodic cueing empowered T. to produce words on the treatment list may be at work here. Prosodic cueing may provide external activation to a prosodic level which operates in closer proximity to the speech programming devices than other levels. Such external activation when added to that still extant in the system, then powers the process of speech production. An alternative account may focus on the potential that prosodic cueing has for overcoming indexing difficulties. As with TPC, it may be the case that prosodic cueing aids in the exclusion of candidates at the lemma level. A given word's prosodic profile may be distinctive enough to highlight which lemma, from amongst the candidates at the lemma level, is the relevant one. Further research into the extent and nature of the benefits conferred by prosodic cueing is needed before a definitive account is arrived at. Figure 18 provides an illustration of how prosodic cues may improve naming ability is participants like S. It may be that a prosodic cue helps to eliminate rivals at the lemma level, thereby compensating for S.'s lack of inhibition at this level. More efficient functioning at the lemma level leads to more accurate naming performance.

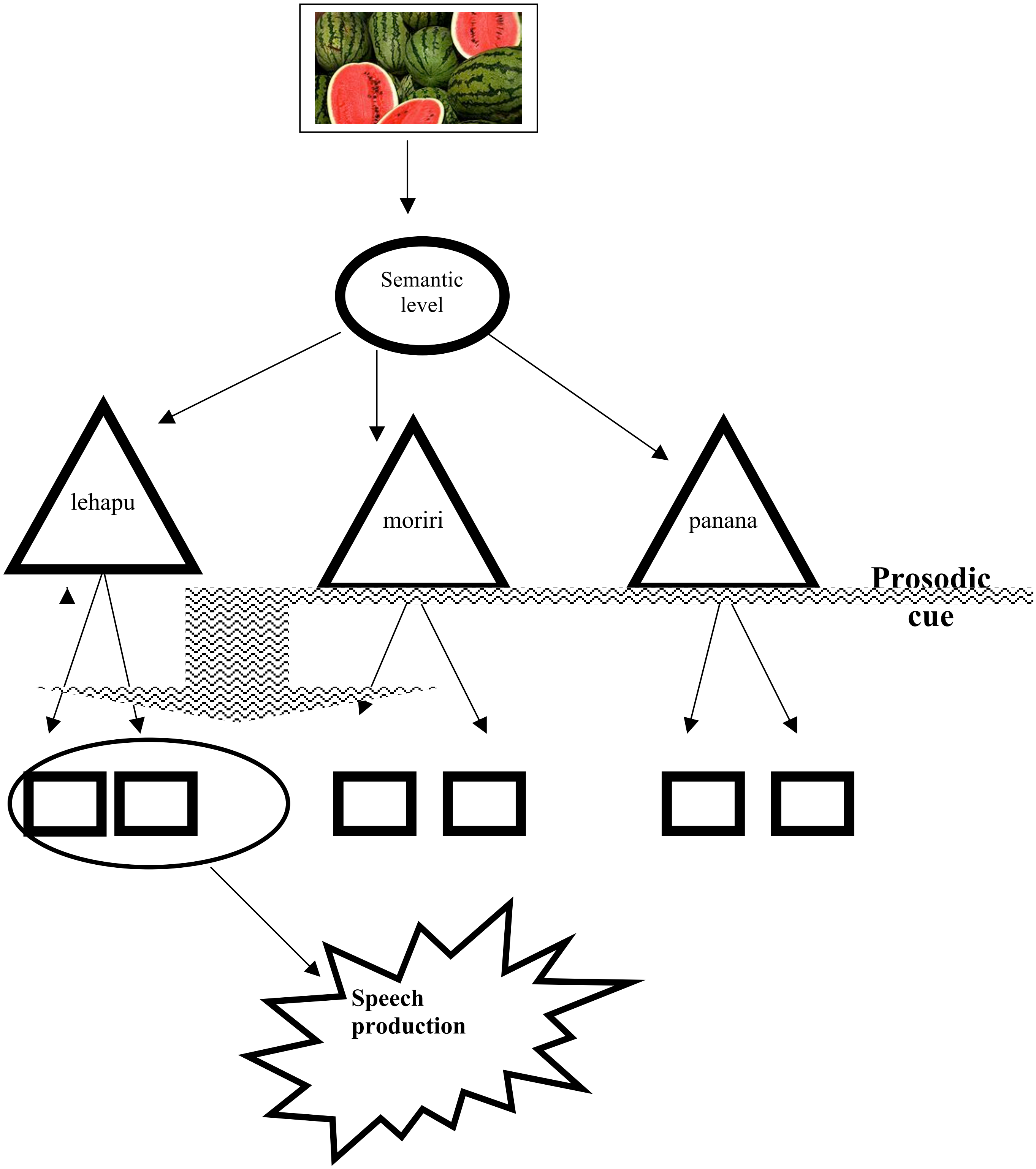

Figure 18. Hypothesized mechanism of prosodic cue in S.

Semantic generalizability in participant S

Pre- and post-test scores obtained on all four semantically-related word lists were used to compile Figure 19. As can be seen in Figure 19, for participant S., none of the treatment conditions was linked to a significant increase in ability to name items semantically related to those expressly targeted during intervention sessions.

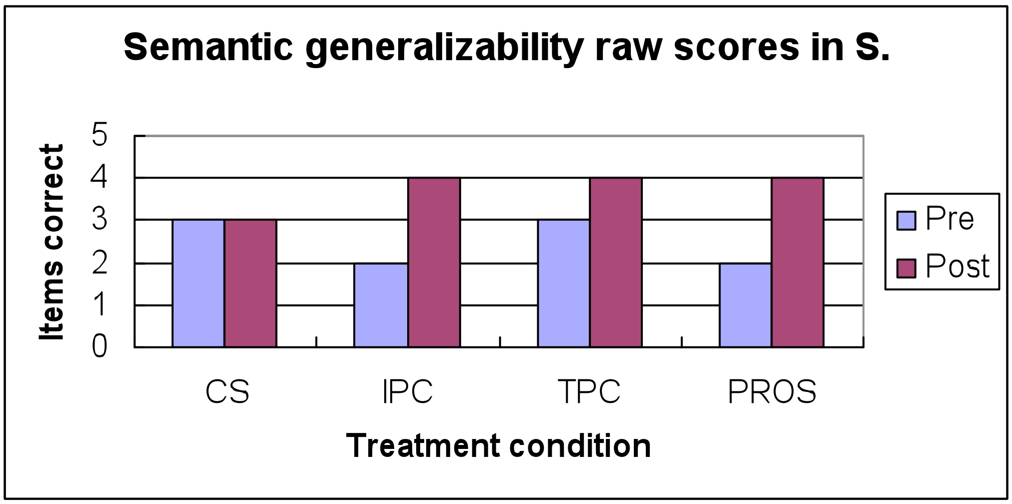

Figure 19. Raw scores for semantic generalizability construct for S.

Key:

CS: Codeswitch cue condition

IPC: Initial phoneme cue condition

TPC: True phoneme cues condition

PROS: Prosodic cue condition

Pre: Pre- treatment scores on semantically related list

Post: Post treatment scores on semantically related list

The data used to compile Figure 19 was used to produce Table 18, which provides information on the statistical significance of the changes (in terms of semantic generalizability) noted for each condition. Using the sign test to ascertain probabilities of change due to random variation (*p=0.05),* lead to the conclusion that none of the treatment conditions were associated with a statistically significant growth in the ability to name items semantically related to those directly addressed during the intervention portion of the study.

Table 18. Data relating to semantic generalizability construct in participant S. across all four treatment conditions.

	Raw scores post-intervention	*Probability of obtaining scores due to random chance*	*Threshold for positive change due to intervention*	*Threshold reached?*
Codeswitch	3/10 (0)	0.377	6/10	No
IPC	4/10 (+2)	0.1719	6/10	No
TPC	4/10 (+1)	0.1719	6/10	No
PROS	4/10 (+2)	0.1719	6/10	No

Participant S. did also not display semantic generalizability at a statistically significant level for any treatment condition. Once again, excessive activation occurring as a result of the interaction between external, cue-engendered activation, and internal activation occurring as a result of an inhibitory deficit, helps to explain why neither CS nor IPC were linked to any significant semantic generalizability. In point of fact, both these conditions were found to be correlated with an increase in semantic paraphasias.

CS cues provided so much activation to the lemma level in S.'s naming apparatus (possible activation pathway: L2 lemma➔shared semantic store➔L1 lemma…intense competition or L2 lemma➔L1 lemma…intense competition) that CS cues were linked to an increase in semantic paraphasias during post-intervention naming performance on the semantically related word list. Data gathered and displayed in Table 17 show 1 semantic paraphasias was produced during the pre-intervention naming evaluation of the semantically related list. During post-intervention testing, this figure rose to 5. While such data must be interpreted with caution due to the small size of stimuli, it is suggestive of the effect that CS cues have on the naming performance of a speaker hamprered by lack of inhibition at the lemma level.

IPCs were also found to be linked to an increase in semantic paraphasias during post treatment naming of the items on the semantically related list (a twofold increase from 3 paraphasias to 6). Again, this increase in paraphasias is though to occur because IPCs provide too much activation at the lemma level which exacerbates S.'s attested lack of inhibition.

Since three more-or-less discrete levels are postulated within the word retrieval system, cues acting at the phonological level failed to activate links between close semantic neighbors, which in turn lead to the low rates of semantic generalizability noted in S.'s performance. It is noteworthy that post-lexically active cues (TPC and PROS) did not lead to an increase in phonemic paraphasias in S.'s naming abilities. This dissociation (supra phonemic level cues leading to an increase in semantic paraphasias while phonemic and prosodic level cues do not lead to a similar increase in phonemic paraphasias) seems to provide evidence for two statements. The first is that activation flow can occur in one direction only. If activation flow could occur in reverse to the normal trajectory followed by activation, any cues provided to S., at any point in the word retrieval system, would lead to increases paraphasias. The second is that inhibition deficits may be selective. It is well established that S. lacks inhibition at the lemma level. If the same was true of the phonological level, phonological level cues would engender an increase in phonemic paraphasias. Such cues are not linked to an increase in phonemic paraphasias, which suggests that the inhibition deficit is isolated to supra-phonemic and prosodic levels.

Persistence in participants T and S

Persistence testing was conducted after an interval of three weeks and the results obtained showed that although some deterioration of naming ability did occur the decline did not reach statistical significance after the cessation of intervention. The raw data collected were used to compile Figures 20 and 21.

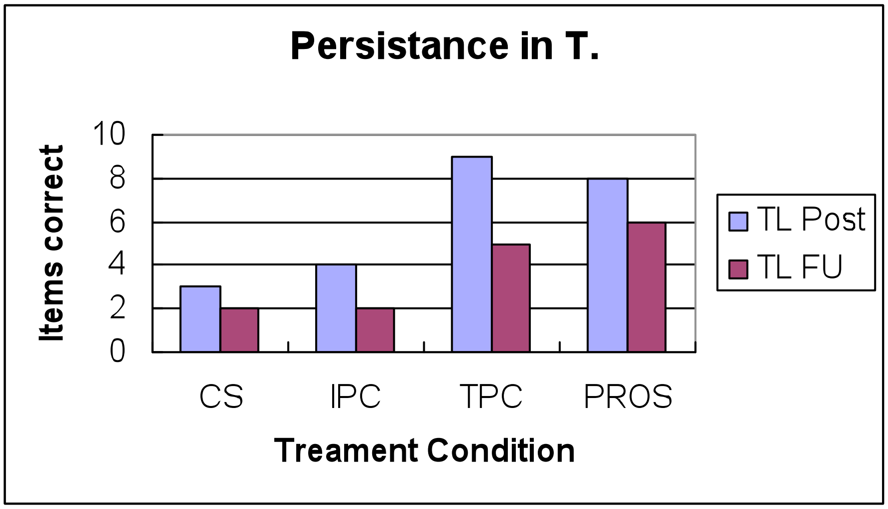

Figure 20. Persistence of therapy effects in participant T.

Key:

TL Post: Scores on treatment list at conclusion of study.

TL FU: Scores on treatment list at follow-up.

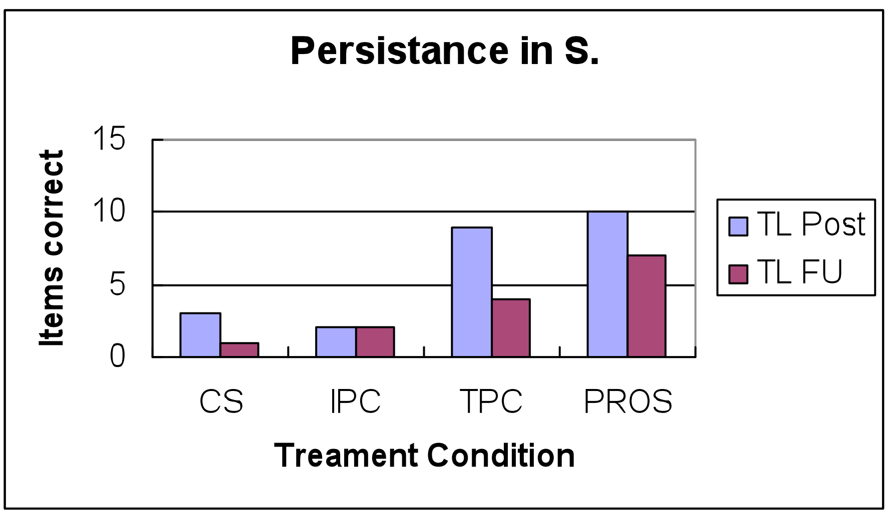

Figure 21. Persistence of therapy effects in participant S.

Key:

TL Post: Scores on treatment list at conclusion of study.

TL FU: Scores on treatment list at follow-up.

An explanation of the persistence of therapy effects should make recourse to the notion of activation potential which is thought to be a central driver of relearning. Every time a mental routine is invoked (i.e. a speaker completes a language task, such as naming a picture) the threshold of activation required to bring system elements (semantic-pragmatic-bundles, lemmas, phonological and prosodic nodes) online is lowered (Paradis, 2004). In the case of the mental lexicon, every word a speaker knows has its own activation threshold which decreases every time a word is used (Marini and Fabbro, 2007). Since the cues used in this study aided the participants in producing words, such cues may have indirectly lead to decreased activation thresholds. The mental activity generated by participation in all of the treatment conditions involved activating portions of the mental lexicon; repeated activation lowered activation thresholds ultimately leading to better functioning (Paradis, 2004). This study and others would seem to suggest that lowered activation thresholds remained lowered, at least until four weeks had passed after the cessation of the treatment phase. Questions relating to the deterioration point of therapeutic intervention have not received a great deal of attention in the speech-pathology literature though the related discipline of behavioral psychology has concerned itself with the notion of learning extinction. Presumably, some residual learning effects are permanent resulting in an increased level of functioning.

This chapter has dealt with the results of this study. Explanations grounded in cognitive neuropsychology have been offered to account for the varying rates of relearning associated with each condition. The following chapter provides some discussion on these results. Clinical and theoretical implications of the results are considered; some suggestions on the role of the four treatment conditions in a South African context are discussed, as are possible ways in which this research might inform refinements to models of bilingual language functioning.

Chapter 6: Discussion

This chapter provides further, in-depth discussion of how these results might influence future research and clinical practice. Comparisons to previous research are made, and some refinements to the current model of word retrieval are suggested. Issues of special relevance to bilingual speakers (cross-language generalization and the role of codeswitching in therapy) are considered. The limitations of the current study and directions for future research are highlighted. Mention is made of some parameters of Sesotho, and how these might be exploited in a clinical setting.

Using the community referenced approach

At the outset of this study, it became evident that a standardized approach to stimulus development has many disadvantages. A cursory examination of some items drawn from the BNT illustrates why speakers may be unable to perform at appropriate levels for neurologically unimpaired adults: ‘pretzel’ ‘beaver’ and ‘globe’ are some of the words used in the BNT. It became clear to the researcher that far from testing naming ability, the BNT and WAB Naming Test (and other commonly used tests of naming) in reality test exposure to Western culture and artifacts.

A further problem inherent in tests such as the WAB naming test and the BNT which flows from a lack of validity is there inability to differentiate between frank anomia and unfamiliarity with the cultural concepts in which the test is grounded. In the case of these tests, many of the unimpaired test takers obtained scores associated with anomia, which would put them into the same diagnostic category as the speakers who are actually anomic.

At the conclusion of the study, it became clear that the community-referenced approach for developing word lists for use in contexts such as South Africa addressed some of the challenges inherent in using standardized tests. One of the chief recommendations of the community-referenced method is that it reduces the influence of cultural variables in studies of anomia, at least in their relation to the development of word lists. If a word list is found to be composed of items which unimpaired speakers can readily name, and which impaired speakers cannot, the researcher can more safely infer difficulties in naming derive from a linguistic deficit and not an experiential one. In essence, the community-referenced method is more valid in that it provides a more accurate view of a speakers naming ability in spite of the speakers lack of experience of Western culture.

The community-referenced approach to word list development is also much cheaper than the use of standardized tests in research. The prices of such materials often make them prohibitively expensive for the bulk of speech-language pathology service provisioners in South Africa. The community-referenced method, in monetary terms, is virtually free. Though it may require a greater time investment, this is no doubt off set by the researcher developing a greater understanding of the language being studied.

Furthermore, the community-referenced approach may have much to recommend it in respect of utility. Using words which align with the everyday experience of community members to assess anomia, gives the therapist a sensible place to start therapy. If a client is unable to name items on a community-referenced list, it makes sense to target those words in therapy, since we can assume that such words are used with a relatively high frequency in the community. Targeting words on community referenced lists ensures that the client will be furnished with words that are useful in the community in which he lives. Using commercial tests to guide therapy may provide the client with less useful items than if therapy is guided by community-referenced materials.

The SLP in South Africa needs methods and principles of therapy that are going to yield results in the community where he works. Community-referenced material development allows the therapist to utilize the resources that exist in the community, instead of mourning those that do not. By engaging with the community, the therapist also grows to understand a little more of the cultural context in which his clients live. This understanding plays a central role in helping a therapist to move from being a dispenser of aid to an ally in building empowering relationships. The community-referenced approach has some support in the literature; The Bilingual Aphasia Test (Paradis, 1987) endevour attempts to harness resources in the community to develop a more valid assessment tool for aphasia.

Comparison to previous research

Relative potencies

Many studies investigating the clinical efficacy of therapy for anomia support the view that intervention helps speakers with anomia to relearn words (Wisenburn and Mahoney, 2009). A large number of studies have shown that various types of therapy ranging from teaching a client to self-generate cues (DeDe et al., 2003) to training words within phonologically-similar triplet groups (Fisher, Wilshire and Ponsford, 2009) play an important role in empowering speakers to name items selected as targets for therapy. This study provides further, qualified support for the role that speech-language therapeutic intervention can play in helping to alleviate some of the symptoms of aphasia routinely experienced by stroke survivors.

Fewer studies of the relative efficacy of different therapy techniques conducted using a single or small number of participants exist. [6]

This current study found that different rates of relearning were associated with the different treatment conditions investigated. As discussed in the Chapter 5, the cues linked to the greatest deal of potency in this study where true phonemic cues and prosodic cues. Very little data to support the use of codeswitch and initial phoneme cues in the context of helping a client to relearn words was forthcoming.

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[6] A study of the relative efficacy of errorless vs. relatively errorful approaches to therapy has been conducted (Conroy, Sage and Lambon Ralph, 2009). This study found very little difference between the errorless (essentially, requiring a participant to repeat items) and errorful (use of cueing hierarchy) conditions (Conroy et al., 2009). Rose and Douglas (2008) used a combination of verbal and gestural cues to successfully treat anomia in a client. Avila, et al (2001) found that priming can facilitate better naming performance. Guiding a client to purposefully circumlocute may also help to resolve moments of anomia (Francis et al., 2002).

Generalizability

As discussed in Chapter 2, questions relating to generalizability have been posed by anomia researchers since the advent of aphasiology as a discipline (Wisenburn and Mahoney, 2009). That anomia therapy usually helps a speaker to relearn the items selected as targets for therapy is generally seen as an uncontroversial assessment (Wisenburn and Mahoney, 2009; Maher and Raymer, 2004). There is less certainty concerning the issue of generalizability (Wisenburn and Mahoney, 2009).

Many researchers have investigated whether or not therapy enables a speaker to retrieve lexical items related in some way to those directly targeted in therapy. A large number of studies have found that therapy designed to exercise functions related to the semantic and lemma levels does indeed lead to an increased ability to name words semantically related to therapy targets. Many researchers have found that if intervention is carefully designed, and certain factors are controlled for, semantic generalizability is an achievable goal in therapy for anomia. Kiran and Johnson (2008) conducted a treatment study which found that treating atypical exemplars of a semantic category (in this case SHAPES) using a semantic feature analysis approach generalized to typical exemplars not directly targeted in therapy in 2 out of 3 participants. Generalization trends in the opposite direction- training typical exemplars to achieve generalization to atypical exemplars- were not noted in the third participant. Francis et al. (2002) found that directing a client with pure anomia (i.e a word finding difficulty in the absence of semantic level dysfunction) to describe and elaborate on the target word during anomic moments helped the client to relearn items treated in therapy and those semantically related to treatment items. Stanczak et al.'s (2006) study of anomia treatment found similar results for one of the participants enrolled, who presented with a mixed phonological and semantic level impairment. Rose and Douglas (2008) noted a statistically significant generalization effect in a study which paired gestural and verbal cues as a treatment for anomia.

In this study, semantic generalizability was one of the constructs identified to measure the relative clinical effectiveness of the four cueing conditions investigated in this study.

Unlike many of the previous studies concerned with this construct, this study did not find any evidence for significant rates of semantic generalizability.

There may be various reasons for this disparity.

Firstly, previous studies of semantic generalizability have specifically been designed to interrogate the effectives of semantic level tasks at promoting the relearning of words semantically related to those directly targeted in therapy. Typically, such tasks require the participant to conduct intense processing at the semantic level, and involve guiding the participant to focus on the meaning of the words (Wisenburn and Mahoney, 2009). Semantic feature analysis treatment, in which a client is required to match statements related to the meanings of therapy targets to the appropriate targets, and to answer 'yes/no' questions based on these statements (Kiran and Roberts, 2009), Constraint Induced Therapy (CIT) (Goral and Kempler, 2009), manipulating the typicality of items featured in therapy (Kiran, 2008; Kiran and Bassetto, 2008; Kiran and Johnson, 2008), focusing on abstract words in a category to improve naming of more concrete words (Kiran, Sandberg and Abbot, 2009), using gesture as part of therapeutic cues (Rose and Douglas, 2008), requiring a client to circumlocute when experiencing a anomic moment Francis et al., 2007) have all been featured and all require a depth of processing absent in a simple cueing paradigm. This study featured two phonological level tasks (TPC and PROS cueing), and phonological level tasks have been identified in the literature as poor promoters of semantic generalizability (Lesser and Milroy, 1993). The other two conditions studied, while seemingly more semantic in nature, did not entail the depth of processing at the semantic level seen in previous studies. Providing a single codeswitch cue is clearly qualitatively different, from a processing point of view, to a task in which a participant has to judge the semantic relatedness of items, or in which a participant has to categorize semantic features of an item. The difference in processing depth between previous studies and the current study may help to explain the difference in semantic generalizability noted.

Secondly, the lack of homogeneity amongst speakers with anomia may account for varying degrees of semantic generalizability across studies. As can seen from Chapter 2, the model of word retrieval as it currently exists is no doubt underspecified but remains complex in its imperfection. The CNP approach to anomia holds that breakdowns in naming performance may occur because of deficits at any one of the three levels within the system, or due to weak links between structures, or because of indexing difficulties within stores themselves (Whitworth et al., 2005). Clearly, the scope for a wide variety of problems to occur is large. Individual variation between clients is large and each client needs to be seen as a separate case (Fisher et al., 2009). Since anomia is really a family of disorders, it is unreasonable to expect results from one study to automatically align well with those obtained in earlier studies. It may simply be the case that the participants in this study presented with an anomia that was qualitatively and quantitatively different from those who have participated in previous studies of semantic generalizability. Many possible sorts of anomia exist, and some techniques may help some speakers and not others to achieve semantic generalizability. A study which seems to furnish results which run counter to established trends does not prove that semantic generalizability is not possible; it simply affirms that anomia is a complex disorder with a number of possible underlying areas of deficit.

As regards phonological generalizability, there are a smaller number of studies which show that therapy revolving around phonologically-based tasks does empower speakers to produce words phonologically similar to those focused on during intervention (Lesser and Milroy, 1993). One recent such approach is word discrimination therapy. This technique revolves around training clients to name words in phonologically related triplets and has recently been linked to significant phonological generalizability (Fisher et al., 2009).

The current study did not probe whether or not the techniques investigated were linked in any way to phonological generalizability, primarily because of word list related concerns.

Firstly, no workable definition of phonological similarity could be found to inform the compilation of phonologically related word lists. None of the authors cited in studies of phonological generalizability provide a robust, consistent delineation of just how much two phonemes have to have in common to be designated ‘similar’. Whether or not similarity depends on manner, place or voicing of phonemes (or some combination of these elements) has not been addressed in the literature. Fisher et al. (2009) circumvent this issue by using words that start with the same phoneme which seems to imply that for two phonemes to be similar, they need to be identical.

Secondly, the word lists used in this study were developed by filtering words through a set of filters, leading to a small number of words associated with each condition. Developing a third word list for each condition (a phonologically related word list) would have required the addition of another filter (words would have to be phonologically similar to those in the treatment list). There are a large number of Sesotho words which are, in some sense, phonologically similar to items appearing on the word lists. However, relative few are nouns; of the remaining nouns, few are highly imagible; and of the few highly imagible candidates remaining, very few can reasonably be expected to form part of the daily context of Sesotho speakers living in the Northern Free State in 2010.

Despite this study's limitations, phonological generalizability remains an important notion in anomia research and further investigation of this concept could help to furnish information about the less well understood portions of the word retrieval model.

Persistence

Persistence has received less attention in the literature than potency. A lack of empirical support for the longevity of gains made in therapy hampers the clinician's ability to allocate resources (of which time is arguably the most precious) efficiently. A number of studies have attempted to fill this gap in the literature, with various time depths for re-evaluating participants post-intervention proposed. Wisenburn and Mahoney (2009) present evidence that therapy may have continuing effects for up to three months after termination of services. DeDe et al.(2003) re-tested the participant in their study 6 weeks after the cessation of formal intervention. Conroy et al. (2009) investigated the extent to which gains made in therapy persisted 5 weeks after the conclusion of intervention, while Rose and Douglas (2008) re-evaluated participants at two points post-intervention namely one month and three months. Francis et al. (2002) re-assessed the participant in their study 2.5 weeks post-intervention.

Investigations of the longevity of therapy gains are almost universal in their findings: gains made during therapy tend to persist, with very little evidence of a return to pre-intervention levels of functioning (Wisenburn and Mahoney, 2009; Conroy et al., 2009; Rose and Douglas, 2008; Francis et al., 2002). In common with other studies of persistence, this study selected a month as the period that would elapse between the end of intervention and re-evaluation and found that while some decay of therapeutic gains had taken place, none of the conditions were characterized by a statistically significant deterioration of post-study ability to name items on the treatment lists.

Francis et al.'s (2002) trenchant point that a lack of additional growth in naming ability after a study has concluded proves spontaneous recovery does not take place is re-enforced by the results obtained in the current study. Naming performance gains persisted but did not exceed the levels noted at the conclusion of intervention.

The short time spans selected during such studies prevent clinicians from claiming that therapy gains persist indefinitely. Comprehensive research into the medium and long term lifespan of therapy gains is needed before clinicians can claim that benefits achieved in therapy amount to lifelong improvements in language and communicative functioning.

Model refinements

The spreading activation model, which centrally informs this study, is the product of a slow, and gradual process (Wilshire, 2008). Research findings are used to update the model, to suggest changes and to make the model ever more specific and explicit (Wilshire, 2008). The data flowing from this study can be used to provide insights into possible ways in which the model can be refined to more accurately reflect naming as it occurs in monolinguals and multilinguals.

Activation summation

The theory of activation summation has become a cornerstone of cue oriented approaches to anomia therapy (Avila et al., 2001). This theory seeks to explain why cues work; how does a cue help a speaker who is experiencing an anomic moment resolve that moment and how do cues empower clients to produce words in therapy and real-life contexts. The success of two cue types in this study in terms of improving naming abilities in 2 bilingual Sesotho-English speakers have been explained by making reference to this theory. This study provides further, qualified support for the use of cues in therapy, and indirectly for the theory underlying the use of such cues.

Prosodic encoding

One of the chief, most clinically useful findings emanating from this study is that prosodic cues appear to be effective at helping Sesotho-English bilingual speakers with anomia relearn how to produce words. Current models (e.g. Whitworth et al., 2005; Wilshire, 2008) are virtually silent on the question of how suprasegmental aspects of word production are encoded. Refinements need to be made to the spreading activation model to reflect the fact that speakers produce words which conform to the stress patterns of a given language. A small number of authors (such as De Bleser, Burchert, Holzinger and Weidlich, 2010) have attempted to investigate the encoding of prosody at the level of the sentence by deriving data from impaired individuals.

This study focused on two categories of cue. Initial phoneme cues, due to the morphosyntactic nature of Sesotho, are thought to act at the lemma level, and thus amount to lemma cues (i.e. they relate to the way in which a word can be used in relation to other words in a sentence). True phonemic cues, by contrast, are hypothesized to have an effect at the phonological level. There is less certainty about the level at which the prosodic cues operated.

Given that phonological level cues were found to be effective in both participants, but especially T., whose anomia is the result of poor activation flow between the lexical and phonological levels, and prosodic cues are effective at facilitating improved naming performance in T., it is reasonable to tentatively conclude that prosodic cues act at the phonological level, or even perhaps at a level between the phonological nodes and the speech production apparatus. One possible explanation for the effectiveness of prosodic cues lies in arguing for the existence of a new node level; a prosodic level at a sub-phonological position in the model. It is hoped that this current study will engender debate on the role of suprasegmental aspects of word production. More research is needed before a prosodic level can be confidently added to the model. Nonetheless, the results obtained in this study, which suggest prosodic cueing as a potentially powerful, therapeutic tool, compel clinicians to examine prosody in the context of the mental lexicon much more closely.

The bilingual mental lexicon

Many authors now agree that bilinguals are not merely two monolinguals in one brain. There is widespread consensus that L1 and L2 system within the mental apparatus of the multilingual speaker are linked (Lorenzen and Murray, 2008; Edmonds and Kiran, 2006). Less agreement exists concerning the nature of the links between L1 and L2. One group of authors argue that L1 and L2 are sub- served by a common semantic-conceptual store (Edmonds and Kiran, 2006). Another supports the view that links may exist at the lemma level (Kroll and Stewart, 1994), while a third (emerging) faction posits links at the phonological level. Precisely how these links operate during complex, common multilingual tasks is also a rich source of debate (see Wei, 2002, for a discussion of one particular view).

Findings flowing from this study support the view that L1 and L2 in the multilingual speaker are linked at the semantic level and/or the lemma level. S.'s performance informed this finding. In the CS condition, an L2 item lead to effects in L1, specifically, an increase in semantic paraphasias. This suggest that there exists some sort of conduit between L1 and L2. Two possible routes were postulated: L2 lemma➔Semantic-conceptual store➔L1 lemma or L2 lemma➔L1 lemma. The experiments which underpinned this study do not allow a definitive statement of support for either of these routes nor do they exclude the possibility that both routes may run in parallel between L2 and L1 subsystems in the multilingual speaker. Furthermore, support for connections at the supra-phonological level do not preclude the existence of further, additional links between the phonological nodes serving L2 and L1. One possible explanation for the cognate effect outlined in Chapter 6 relies on the idea that the phonological forms relevant to L1 and L2 are linked

Activation flow

Questions relating to the direction(s) in which activation can flow through the word retrieval system continue to generate a great deal of debate amongst mental lexicon researchers (Wilshire, 2008). Both a 'downward only' (semantic➔lexical➔phonological) (Levelt et al., 1999) and a 'reversible' or 'interactive' (semantic➔lexical➔phonological AND phonological➔lexical➔semantic) (Wilshire, 2008) position exist, with the former arguing that activation can proceed in one direction only and the latter arguing for two directions of activation flow.

The results of this study do not lend credence to either stance, with some data seeming to support the unidirectional position and other data seeming to support the bidirectional stance. It is noteworthy that both unidirectionalism and bidirectionalism are compatible with results obtained from S.'s participation under the TPC and PROS conditions. While CS cues and IPC's lead to increases in semantic paraphasias, cues provided at the phonological level (TPC's and PROS cues) had little to no effect on higher levels of the system. Such cues are believed to activate the phonological nodes associated with the relevant words. That no semantic paraphasias were noted seems to show that this activation did not flow from the phonological level to higher levels where links between various lemmas and semantic bundles exist which in turn suggests that activation provided at the phonological level cannot spread to other levels (i.e. it cannot spread back 'up' the chain of structures and links). In essence, these findings support the view that a phonological event cannot have an effect on the lexical or semantic levels.

Conversely, phonological cues provided to S during the TPC and PROS conditions were found to have a positive effect on her naming ability, suggesting that such cues were efficient at eliminating competition at the lemma level. In essence, and in seeming contradiction to the finding that activation cannot flow from phonological nodes to lemmas, a phonological event was found to have an effect on the lemma level.

A possible solution to this predicament may lie in arguing that the Editor played a central role in using the phonological cues to eliminate competition at the lemma level. The Editor, an overarching, executive construct which oversees the process of word retrieval (Abel et al., 2009), may have used the phonological cues to remove unlikely candidates from the selection process during the TPC and PROS portions of this study. Reverse activation, in this explanation, had no real impact on events at the lemma level. Rather, the action of the Editor was responsible for deciding which lemmas to eliminate, and in so doing, promoted better naming abilities. Further research is clearly needed before a good working knowledge of the possible interaction between the Editor and activation flow in one or both directions is developed.

Disassociation

S. presented with a lack of inhibition at the semantic and lemma levels during evaluation. This finding was confirmed when certain types of cues were linked to an increase in semantic paraphasias. CS and IPC cues provided extra activation at the lemma and semantic levels which exacerbated the pathological lack of inhibition leading in turn to further errors of naming. Similar cues provided at the phonological level (TPC and PROS) did not lead to a significant increase in paraphasias. This suggests that lack of inhibition occurred selectively in S.'s mental lexicon, at one level and not at another.

This sort of disassociation between levels lends weight to the concept that the mental lexicon is essentially modular in nature, as asserted by the framers of the PALPA (Kay et al., 1992) and others in the CNP school such as Martin et al. (1999).

Bilingual perspectives

Clinical codeswitching

In this study, codeswitching was identified as a bilingual behaviour which might be incorporated into a therapeutic context. Specifically, cues based on codeswitching (i.e. the provision of an L2 version of target word) were assessed in terms of their potency (i.e. how effective are such cues at helping participants learn items on a list), semantic generalizability (i.e how effective are such cues at helping participants learn items semantically related to those on the treatment list) and persistence (i.e. how long after the end of intervention do the learning effects related to the treatment list last). Codeswitching cues were associated with minimal, statistically insignificant amounts of potency and semantic generalizability. Gains made, such as they were, were found to be persistent and had not diminished significantly one month after the conclusion of the intervention portion of the study.

Of particular interest is the effect that codeswitch cues seemed to have on the naming performance of S. As can be seen from the response record provided in the Appendix and partially reproduced in Table 19, when asked to name the items on the semantically related list assigned to the codeswitch condition (BODY PARTS) before a codeswitch cue was introduced, S. produced a single semantic paraphasia. When asked to name the same items after the conclusion of the intervention portion of the study, the number of semantic paraphasias had risen to 9. This increase was explained by making recourse to the notion that codeswitch cues provide S. with too much activation, which amplifies the effect of her current inhibition difficulties. While this result may be derived from too little data to form definitive conclusions, a five fold increase in paraphasias does suggest that in some instances codeswitching cues may be doing more harm than good.

Table 19. Responses produced by S for confrontation naming task using semantically related word list ('BODY PARTS') under the CS condition.

Pre-treatment	*Syntactic class analysis*	*Post-treatment*	*Syntactic class analysis*
hair (moriri) SEMANTIC PARAPHASIA: 'shave'	1 verb	hair (moriri) SEMANTIC PARAPHASIA: 'shave'	1 verb
head (hlooho) CORRECT	1 noun	head (hlooho) CORRECT	1 noun
back (mokoktlo) NO RESPONSE	NA	back (mokoktlo) SEMANTIC PARAPHASIA: 'shoulder, arm'	2 nouns
skull (lehata) NO RESPONSE	NA	skull (lehata) SEMANTIC PARAPHASIA: 'dead person, grave'	2 nouns, 1 adjective
ear (tsebe) CORRECT	1 noun	ear (tsebe) CORRECT	1 noun
nose (nko) VOCALIZER	NA	nose (nko) VOCALIZER	NA
ankle (leqaqalaina) OTHER	NA	ankle (leqaqalaina) SEMANTIC PARAPHASIA: 'toe' 'foot'	2 nouns
blood (madi) PHONEMIC PARAPHASIA: 'nati'	1 noun	blood (madi) PHONEMIC PARAPHASIA: 'nati'	1 noun
eye (leihlo) CORRECT	1 noun	eye (leihlo) CORRECT	1 noun
skin (letlalo) NO RESPONSE	NA	skin (letlalo) SEMANTIC PARAPHASIA: 'black, white'	2 adjectives
	TOTAL: 4 nouns (4 targets) 1 verb 0 adjectives		TOTAL: 10 nouns (1 target, 9 paraphasias) 1 verb 3 adjectives

The data provided in Table 19 reveals a subtle qualitative difference between the semantic paraphasias occurring before and after the codeswitch cue based intervention. Pre- intervention paraphasias appear to be relatively simple mis-selections of close semantic neighbours e.g. ‘foot’ when ‘hand’ is required; ‘shave’ when ‘hair’ is required. Post-intervention paraphasias, by contrast, appear to index a more complex deficit process. In some cases, when naming the items on the list after being introduced to codeswitch cues, S. produced paraphasias which were long strings of words related to the target item. For example, when the target item was ‘hand’, S. produced ‘glove, foot, shoe’. As can be seen from the response record ,in many instances, the paraphasias produced crossed syntactic class boundaries e.g. ‘bend’ for ‘elbow’, replacing a noun with verb, similar to ‘swallow’ for ‘neck’. These results seem to suggest that codeswitch cues, at least as they pertain to S.’s naming abilities, provide so much additional activation, that the system’s residual inhibition is overwhelmed. Such over-taxation in turn leads to the production of whole strings of words, or the production of distant semantic relatives of the words being targeted. Similar results (cues leading to a qualitative change in semantic paraphasias) have been identified in at least three other studies namely Kiran and Roberts (2009), Rose and Douglas (2008) and Francis et al. (2002). Similarly, IPC cues (Figure 22.) were linked to paraphasias which crossed syntactic boundaries. By contrast, TPCs and PROS cues had markedly fewer paraphasias which can be classified as verbs or adjectives, which provides further support for the use of these techniques in therapy contexts.

Taken in combination, these results (low potency, low semantic generalizability and an increase in the complexity and number of paraphasias) seem to suggest that a judicious approach to the use of codeswitching in the context of therapy for bilingual speakers with anomia is required. In the context of this study, codeswitching proved not only to be ineffective but harmful in some respects. As this study illustrates, codeswitching may not directly address the speaker’s constellation of strengths and weaknesses, and may thus not be indicated as a therapeutic tool for helping a speaker relearn a given behaviour. Furthermore, for the two participants in this study, it proved to have no benefit as regards generalizing behaviour to contexts outside of therapy.

These statements must be weighed against an understanding of the scope and nature of this study. The behaviour investigated in this study was very strictly delineated and was measured using a narrow metric. The purpose of this study was to examine the effect that various cueing conditions have on participants' ability to complete a specific task (naming items on a list). In the space in which this study occurred, codeswitching seemed to have little value as an intervention technique. Therapists who aim to establish a specific behaviour in therapy need to consider carefully the psycholinguistic aspects of codeswitching and the way in which such will interact with the client's abilities. Conversely, therapists who embrace a more pragmatically, communication-oriented approach may find codeswitching to be a fruitful therapy tool, as suggested by Lorenzen and Murray (2008). Research into the use of codeswitching to bolster overall communicative effectiveness (as opposed to using codeswitching to relearn a clearly defined behaviour) has shown that encouraging clients to codeswitch has a positive impact on their ability to make themselves understood (Roberts and Deslauriers, 1999). In communities in which multilingualism is widespread, directing clients to access an item in any of the languages they speak may prove to be helpful since multilingual interlocutors will be able to understand the message being conveyed, even if it is composed of material from more than one language (Roberts and Deslauriers, 1999). A diagnosis of pathological codeswitching, which is a concept well established in the literature (Ansaldo, Saidi and Ruiz, 2009), may be the product of perspective; from the (often monolingual) researchers point of view, language mixing seems to subvert communication, but in a largely multilingual community, where most interlocutors speak both the 'right' and the 'wrong' language, codeswitching may bolster overall communicative effectiveness. As Penn points out (????), the line between what is pathological and normal may be very fine, especially in multilingual communities. Furthermore, research shows that non-impaired bilinguals use codeswitching as a method of self-cueing, and this suggests that encouraging codeswitching may increase a bilingual client's ability to self-cue (Goral et al., 2009).

Cross-language generalization

One area of bilingual aphasia that has been the focus of some research in the past decade is that of cross language generalization. In essence, some authors have found that it is possible to achieve gains in L1 by targeting L2 material in therapy, provided the less dominant language is the one in which therapy activities take place (Edmonds and Kiran, 2006; Roberts and Kiran, 2007) and that other factors (such as pre--stroke language proficiency, age of acquisition of each language, post-stroke level of language impairment and type and severity of aphasia) are considered (Kiran and Roberts, 2009). The CS cue portion of this study represented just such an exercise, using L2 material to attempt to achieve gains in L1 naming abilities. As can be seen from Figures 7, 13, 15 and 19 no positive gains were associated with this technique. Once more, caution in interpreting these results is required. There is a qualitative difference between the cueing technique as stipulated in this study and those used in other studies. Previous studies have required a greater depth of processing when working with L2 material while this study simply provided an L2 word (the participants were not directed to attend more closely to some aspects of the words meaning or sound). Had this study featured more intensive processing of L2 material, the results obtained may have added support to the cross language effects found in the literature.

The cognate effect is an aspect of bilingual aphasia that has been investigated in recent years (Kohnert, 2004). Cognates are words in two languages that are share many aspects of phonology and etymology (e.g. *elephant* and the Spanish word *elefante, zip* and the Zulu word *iziphu*). Researchers have found that targeting words in one language spoken by a bilingual improves naming abilities for cognates of these words in the other language spoken by a bilingual. Focusing on ‘elephant’ in therapy with a Spanish-English bilingual will not only improve the client’s ability to produce this word but will also improve a client’s ability to produce *elefante* (Kohnert, 2004).

No evidence for the cognate effect was found in this current study. Table 20 illustrates a common pattern found amongst South African languages. For historical reasons related to settler movement patterns, Sesotho speakers tended to borrow words for novel concepts from the Afrikaans-speaking pioneers they came into contact with, while Nguni speakers tended to borrow words for novel concepts from the English speaking Natal and Eastern Cape settlers.

Table 20. Cognates amongst the Indo-European and Southern Bantu languages of South Africa.

English	*Afrikaans*	*Sesotho*	*Nguni*
motorcar	*kar*	*Koloi*	*imoto* (Zulu)
horse	*perd*	*pere*	*hhashi*(Zulu)
onion	*ui*	*eie*	*anyinisi* (Swati)
pea	*ertjie*	*erekisi*	*uphizi* (Zulu)
pencil	*potlood*	*potloloto*	*pensile* (Xhosa)

(after Mokoena (1998) and Goodwill, Kotze, Thwala, Tshabe, Mabuya, and Dikeni (1991))

Since the participants in this study were Sesotho- English bilinguals, very few cognates were featured in any of the treatment lists, and the cognate effect was thus not noted. South Africa may prove an ideal arena in which to test the cognate effect, given the right study design. If a Zulu-English bilingual, or a Sesotho-Afrikaans bilingual acted as the participant, hypotheses related to this effect could be tested. This would represent something of a novel approach, given that the effect has only been identified in speakers of two closely related languages (e.g. English and Spanish) (Kohnert, 2004). If the cognate effect could be shown to exist in a person who speaks two completely unrelated languages, support for its exploitation in therapy settings would be strengthened. Furthermore, relatedness of languages may be another proviso to append to those which determine the extent to which cross linguistic generalization occurs in speakers with aphasia. Currently factors such as pre--stroke language proficiency, age of acquisition of each language, post-stroke level of language impairment and type and severity of aphasia are considered (Kiran and Roberts, 2009).

Parameters and therapy

Two of the therapy techniques investigated in this study were developed from an understanding of the parameters of Sesotho (i.e. those characteristics of Sesotho which make it different from languages such as English). This parametric approach proved, within the limits and confines of this necessarily small study, to be the most productive. The two techniques suggested by the parameters of Sesotho showed the greatest amount of potency while the two techniques suggested by other considerations proved to have much less utility at helping the participants relearn words of treatments lists.

Other parameters of Sesotho might also prove to be useful allies in a therapy setting. Sesotho orthography differs from English orthography in that Sesotho orthography is almost completely regular, demonstrating a much greater degree of correspondence between spoken and written forms. Written stimuli in therapy may fulfil different roles, depending on the language targeted. Ardilla (2001) described a therapeutic study in which regular Spanish orthography was used to help an aphasic speaker regain some elements of language functionality. Similar results may be possible in Sesotho, if SLPs working with Sesotho speaking people with aphasia are parametrically- informed enough to exploit this characteristic of Sesotho.

Similarly, the Sesotho noun class system may prove to be a source of possible therapy techniques. Any method derived from work with Sesotho speakers would have applicability in the other Southern Bantu languages of South Africa, given the similarities of morphosyntax in this family. The Sesotho noun class system accords membership on the basis of two factors. Firstly, phonology plays an important role; most nouns which are members of the *le-ma* class (e.g. *lebone* ' light' *mabone* 'lights') are inflected for number and a variety of other quantifiers using the same set of particles. Secondly, semantics seems to play something of a lesser role in deciding class membership. Based on an analysis of examples provided in Guma (1971), Doke and Mofokeng (1974) and Mokoena (1998), classes 1 and 2 (*mo-ba)* membership seems to be determined by semantic considerations. All nouns which are members of these classes describe people, while no semantic patterns for the other classes have been noted. Essentially, in Sesotho, all members of classes 1 and 2 belong to the semantic category PEOPLE.

How this characteristic of Sesotho might be utilized in a therapy context is not yet clear. A parametrically-aware therapist might speculate that generalization to untrained, semantically related items might occur readily within classes 1 and 2, if stimuli are limited to class 1 and 2 members. Such speculations need to be tested by experiment, but if they prove to be true, or even partially true, new avenues for therapy, unqiue to speakers of Sesotho are suggested.

Crucially, these gains may be available to speakers of languages like Spanish and Sesotho, and less accessible to speakers of languages like English. By appreciating the differences between languages, the therapist develops an understanding of new ways of approaching therapy.

This chapter has discussed the results of this study in relation to previous research and the South African clinical context. The following chapter highlights some of the limitations of this study and suggests provisos that should be considered when interpreting the results of this study. Future research directions, such as investigations into the encoding of prosody during language tasks, and the effect that the treatment conditions have on general language functioning and communication, are also considered.

Chapter 7: Limitations and future directions

The results emanating from this study must be interpreted in the light of the clearly and narrowly delineated scope of the study design and execution.

This study featured a small number of participants. The use of small group samples in CNP studies is well established and is not usually seen as a central limitation in studies of this type. Since the population of people with anomia is heterogeneous, techniques developed and endorsed in studies of anomia should be applied with caution to diverse clients. A thorough and growing understanding of any one client's constellation of strengths and weaknesses, as well as their communicative context will provide additional guidance when deciding if the methods outlined in this study are to be employed. Furthermore, this study, like all small group studies occurring in the CNP endeavor, should not be viewed as an isolated exercise, but as part of an expanding body of literature which provides proof for the value of therapy for anomia.

While this study identified two techniques that were linked to a statistically significant growth in naming ability, several important matters relating to other measures of efficacy remain unanswered at this time.

Whether or not gains achieved in therapy carry over in real life contexts outside of the therapy room is an important concern that is increasingly receiving attention in the literature (Antonucci, 2009; Goral and Kempler, 2009; Kiran and Bassetto, 2008; Rose and Douglas, 2008; Edmonds and Kiran, 2006). This study can be seen as a form of primary research. It has established the usefulness of TPC and PROS cues in empowering two Sesotho-English bilingual speakers with anomia to produce words on a treatment list. The next step in developing support for these techniques would be to interrogate the extent to which positive growth in naming improves the client's ability to communicate in his/her everyday context.

These techniques originated in an understanding of the parametric uniqueness of Sesotho. It is the view of the researcher that the PROS cue proved to be effective because of the fact that Sesotho is a syllable timed language. Since current mental lexicon models poorly specify the location or role of systems pertaining to suprasegmental structure (Laganaro, 2008), it is impossible to definitively state why such a technique would be less useful when working with a client who speaks a foot timed language. Future research may answer questions relating to this issue. Using the sparse knowledge available at present, it may be possible to (tentatively) hypothesize that the PROS technique would not be associated with a significant growth in naming ability when used with English speaking clients. The argument underlying this statement relates to the complexity of stress assignment in English as compared to Sesotho. Sesotho stress patterns are derived using a very simple rule (i.e. stress the penultimate syllable of an utterance) (Zerbian and Barnard, 2008) while English stress assignment patterns are much more complex. Explanations of stress assignment in Germanic languages such as English make reference to an explanation of the interaction of open and closed syllables and the position of metric feet in a sentence (Janssen and Domahs, 2008). In short, the PROS cue may work better for the Sesotho speaker because it requires the Sesotho speaker to apply one simple rule in many different contexts. In contrast, a PROS based technique might not be as beneficial to an English speaker since prosody is assigned via a large set of complex rules which are applied variably in variable contexts.

Finally, the study does nothing to answer questions relating to the long term effects of therapy. Persistence of therapy gains was measured at a month post-intervention, but whether or not gains made amount to a lifelong improvement in naming ability cannot be answered using the data gathered.

Chapter 8: Concluding remarks on effective, theory-grounded therapy for anomia and aphasia in South Africa

The is an attempt to empower the speech language pathologist practicing in South Africa to face and master some of the many challenges related to practicing in our country. Several attitudes, strategies and tools for overcoming such challenges are suggested by the execution and results associated with this study.

SLPs in South Africa should, this study recommends, adopt a measured attitude towards methods and approaches to anomia evaluation and therapy developed for use with speakers of European languages. A judicious stance should inform the methods that an SLP uses when providing therapy to speakers of Southern Bantu languages. Initial phoneme cueing is a mainstay of clinical anomia research and practice. The parametric differences between Indo-European and Southern Bantu languages have been discussed elsewhere in this study. The empirical results emanating from this study suggest that SLPs in South Africa should be circumspect when using initial phoneme cues if they are providing therapy to clients who speak Southern Bantu languages. Such cues were found to have very little effect on improving naming abilities in the two participants in this study.

Stage One of this study confirmed what many SLPs in South Africa have known for some time, namely that assessment instruments normed on speakers who move in a literate, Western-European context, have very little statistical validity when working with people living in rural South Africa. During Stage One, healthy, neurologically unimpaired adults obtained very poor scores on standardized tests of naming. A straight-forward, non-skeptical analysis of such results would suggest anomia, in the face of a total absence of any communicative failure in daily living. Such tests were found to be invalid for the setting in which this study occurred because these tests did not assess what the framers claim they assess. In the setting of rural South Africa, standardized naming tests do not provide information about a client's inherent naming ability but rather about the degree to which they have been exposed to Western-European artifacts and culture.

An alternative method for assessing naming ability was devised and used in Stage One to originate the word lists used during this study. Sources of words (such as dictionaries and language guides) provided a preliminary list. This list was then pilot tested on 10, unimpaired speakers of Sesotho living in the Northern Free State. Items which proved difficult for these speakers to name were removed from the list, and the 4 treatment list and 4 semantically related lists were formed.

The community-referenced based approach used in Stage One has utility for the South African SLP. The most compelling argument to support community-referencing is that it leads to an instrument which provides more valid information about naming abilities since community-referencing grows out of an understanding of language functioning as it actually occurs in the communities where clients live. SLPs can use such lists with greater confidence than would be the case than if they used standardized lists; SLPs can more safely attribute naming failures to anomia and not extraneous factors. Moreover, the community-referenced approach is inexpensive when compared to acquiring standardized tests.

Parametric aphasiology, or an approach to studying and treating aphasia grounded firmly in the notion that aphasia will affect different languages differently, proved to be a powerful guiding principle in this study. Two important differences between Sesotho and English (the language of study in most anomia research) were highlighted as possible starting points for novel therapy techniques: Sesotho's status as a noun class language and the syllable timed nature of its prosody suggested cueing techniques. Both techniques flowing from this parametric awareness proved to have some utility in empowering both clients to name items on a treatment list. Given that the current models of the mental lexicon are underspecified, it is not yet possible to provide a definitive discussion as to why these techniques proved superior to initial phoneme cueing. The results do, however, motivate SLPs in South Africa to embrace parametric aphasiology more readily than is currently the case. Other parameters may suggest new therapy techniques to be used in clinical practice.

It is impossible to operate within the realm of parametric aphasiology if a therapist is not a competent theoretical linguist. Those who design the curricula for speech-language pathology students should take note of the importance of parametric aphasiology, and the discipline of linguistics should occupy a central position in the training of future speech-language pathologists. The need for training therapists who are also competent linguists is greater in South Africa than elsewhere, given that our clients speak more languages, and linguistics provides knowledge useful in treating many different clients who speak many different languages. If we, as SLPs in South Africa, are to meaningfully serve our clients, we need more training in linguistics.

Bilingual aphasiology has long been a neglected field within the broader discipline of aphasiology. However, aphasia in bilingual people is currently experiencing something of a boom with more and more publications appearing every year. Codeswitching, a behaviour which is largely confined to bilingual speakers, has been examined for clinical usefulness as part of the ongoing bilingualism project within aphasiology. Some authors strongly support the utility of codeswitching as a therapy technique. Given that South Africa is undoubtedly one of the most multilingual countries today, with monolingualism being rare, codeswitching appears attractive to the SLP working with clients who have anomia in South Africa. This study suggests a cautious and balanced outlook regarding codeswitching. The data suggest that if the goal of therapy is to empower a client to name items on a treatment list, or to generalize a positive effect to items semantically related to those on a treatment list, codeswitching cues have limited clinical utility. In some instances, with clients whose anomia is characterized by a lack of inhibition, such cues may actually have a deleterious effect on performance. This study was constructed in such a way that no effort was made to answer questions related to the overall communicative value of codeswitching, or the use of self-generated codeswitch cues. The results must be viewed in this light and codeswitching has been shown to have a beneficial effect outside of the narrow confines that were used in this study.

That all results were linked to persistence of effects one month after the conclusion of therapy illustrates that therapy is worth the time-investment it entails. Presumably if the SLP in South Africa is to use his time optimally, he should select the therapy techniques which are linked to the greatest growth in naming performance. However, persistence does not seem to differentiate between the methods investigated in this study.

Finally, this study illustrates the inherent value of mental models of language functioning, specifically CNP, for the clinical context in South Africa. Since such models are developed to be general schemas of mental functioning (Fisher et al., 2009), they have no substantial links to any one language but are representations of the common architecture underlying all languages. This general quality means that CNP has enormous potential for use in clinical settings in South Africa. In this study, a researcher, who cannot speak Sesotho, was able to use the ethos and content of theories grounded in CNP (primarily the theory of the mental lexicon and spreading activation) to develop a set of hypothesis relating to language behaviour as it occurred in two bilingual speakers of English and Sesotho. Such an approach of formulating and testing hypotheses related to client behaviour is an integral part of the CNP endeavour (Kay et al., 1992). These hypotheses were tested and modified. CNP conceptualizations combined and coalesced with an appreciation of some aspects of bilingual functioning and the parameters of Sesotho to suggest a number of treatment conditions. Theoretical constructs and concepts from the CNP school were used to interpret results flowing from this study. In essence, CNP was the bedrock of this study.

This study occurred in an environment marked by linguistic diversity. Despite the language barriers between the researcher and the participants, a working, useful understanding of the participants' symptoms was developed. The conditions extant during this study mirror those at large in South Africa. That CNP was able to guide the project proves that CNP is of inestimable value to the SLP wishing to deliver a worthwhile, theory-grounded service to his clients.

In closing, if I had to set down here exactly why I started this project, my answer would talk about two people.

The first is a clinical instructor who gifted me an old copy of *Linguistics and Aphasia* (Lesser and Milroy, 1993) during my third year of study. The instructor was an English-speaking therapist working in a large urban hospital, chiefly with people who spoke languages other than English. She knew I was 'interested in linguistics' and gave me what has become one of my most treasured texts because (in her own words) she didn't have time for linguistics. This text was the first source I read when starting out, and inspired me to consult newer research.

The second is T. I recall crying with him the first day we met. He was frustrated and angry that he could no longer name his wife, or his two children. He sobbed bitterly and I cried because I imagined for a brief moment what it would be like to lose words.

I hope that this study will convince SLPs like my instructor to make time for linguistics. I know that I am a better therapeutic partner to people like T. and S. because I am interested in linguistics. I am optimistic that others will come to see the value of the treasures hidden in our sister discipline. We can help people like T. and S. find their way to healing if we are wise, and brave.

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Appendix I: Sesotho adaptation of Naming subtest of the Western Aphasia Battery (WAB).

IV. Naming.

Object Naming

English target	*Sesotho adaptation*
gun	*sethunya*
ball	*bolo*
knife	*thipa*
cup	*kopi*
safety pin	*no Sesotho equivalent; English item used.*
Hammer	*hamore*
toothbrush	*borosolo la meno*
eraser	*no Sesotho equivalent; English item used.*
Padlock	*seloti*
pencil	*potloloto*
screwdriver	*no Sesotho equivalent; English item used.*
Key	*senotlolo*
paperclip	*no Sesotho equivalent; English item used.*
Pipe	*peipi*
comb	*kama*
elastic	*no Sesotho equivalent; English item used.*
Spoon	*kgaba*
scotchtape	*no Sesotho equivalent; English item used.*
Fork	*fereko*
matches	*dimatshi*

Sentence completion:

1. The grass is ___ (green): Jwang bo___ (tala).
2. Sugar is ___(sweet or white): Tshekeri e___(monate kapa tswehu).
3. Roses are red, violets are ___(blue): Rosa e kgubedu, violete e___ (bolou)
4. They fought like cats and ___(dogs): Ba lwanne jwalo ka katse le___(dintja).
5. Christmas is in the month of ___(December): Keremese e kgweding ja ___(Tshitwe).

Responsive speech:

1. What do you write with?: O ngola kang? (pen, pencil: pene, potloloto
2. What colour is snow?: Lehlwa le mmala o jwang? (white: tswehu)
3. How many days are in a week?: Beke e na le matsatsi a makae? (seven: supa)
4. Where do nurse work?: Baoki sebetsa kae? (hospital: sepetlele)
5. Where can you get stamps?: O ka reka setempe kae? (post office: poseng).

Appendix II: Sesotho adaptation of the Boston Naming Test (BNT).

English target	*Sesotho adaptation*
1. bed	*bethe*
2. tree	*sefate*
3. pencil	*potloloto*
4. house	*ndlu*
5. whistle	*molodi*
6. scissors	*skere*
7. comb	*kama*
8. flower	*palesa*
9. saw	*sakga*
10. toothbrush	*borosolo la meno*
11. helicopter	*No Sesotho equivalent: English item used*
12. broom	*lefielo*
13. octopus	*No Sesotho equivalent: English item used*
14. mushroom	*samepione*
15. hanger	*No Sesotho equivalent: English item used*
16. wheelchair	*No Sesotho equivalent: English item used*
17. camel	*kamele*
18. mask	*mampokisi*
19. pretzel	*No Sesotho equivalent: English item used*
20. bench	*setulo*
21. racquet	*No Sesotho equivalent: English item used*
22. snail	*kgofu*
23. volcano	*No Sesotho equivalent: English item used*
24. seahorse	*No Sesotho equivalent: English item used*
25. dart	*motsu*
26. canoe	*No Sesotho equivalent: English item used*
27. globe	*No Sesotho equivalent: English item used*
28. wreath	*No Sesotho equivalent: English item used*
29. beaver	*No Sesotho equivalent: English item used*
30. harmonica	*No Sesotho equivalent: English item used*
31. rhinoceros	*tshukudu*
32. acorn	*No Sesotho equivalent: English item used*
33. igloo	*No Sesotho equivalent: English item used*
34. stilts	*No Sesotho equivalent: English item used*
35. dominoes	*No Sesotho equivalent: English item used*
36. cactus	*No Sesotho equivalent: English item used*
37. escalator	*No Sesotho equivalent: English item used*
38. harp	*No Sesotho equivalent: English item used*
39. hammock	*No Sesotho equivalent: English item used*
40. knocker	*No Sesotho equivalent: English item used*
41. pelican	*No Sesotho equivalent: English item used*
42. stethoscope	*No Sesotho equivalent: English item used*

43. pyramid	*No Sesotho equivalent: English item used*
44. muzzle	*No Sesotho equivalent: English item used*
45. unicorn	*No Sesotho equivalent: English item used*
46. funnel	*No Sesotho equivalent: English item used*
47. accordion	*No Sesotho equivalent: English item used*
48. noose	*No Sesotho equivalent: English item used*
49. asparagus	*No Sesotho equivalent: English item used*
50. compass	*No Sesotho equivalent: English item used*
51. latch	*No Sesotho equivalent: English item used*
52. tripod	*No Sesotho equivalent: English item used*
53. scroll	*No Sesotho equivalent: English item used*

54. tongs	*No Sesotho equivalent: English item used*
55. sphynx	*No Sesotho equivalent: English item used*
56. yoke	*lebanta*
57. trellis	*No Sesotho equivalent: English item used*
58. palette	*No Sesotho equivalent: English item used*
59. protractor	*No Sesotho equivalent: English item used*
60. abacus	*No Sesotho equivalent: English item used*
Total	

Appendix III: Sesotho adaptations of PALPA subtests.

8. Nonword repetition task.

Original target	*Adapted target*
ality	*alite*
vater	*vate*
splant	*pan*
crealth	*rei*
egular	*egula*
drattle	*rattle*
riety	*rieti*
ipical	*ipica*
sprawn	*ran*
ampty	*ame*
drange	*dera*
polid	*poli*
acutty	*acuti*
slurch	*sel*
gaffic	*gafi*
funior	*funi*
cleast	*kel*
prench	*pen*
larden	*lad*
grank	*gar*
enitor	*enito*
lerman	*lema*
adio	*adi*
splack	*sep*
truggle	*tug*
inima	*inima*
anify	*anifi*
plonth	*pon*
pelter	*pel*
stirple	*sir*

9. Imageability and Frequency Repetition.

English target	*Sesotho target*	*English target*	*Sesotho target*
audience	*letswele*	alcohol	*tahi*
battle	*lwana*	axe	*selepe*
church	*kereke*	cart	*kariki*
coffee	*kofi*	drum	*moropa*
fire	*mollo*	elbow	*setswe*
hand	*letsoho*	elephant	*tlou*
hospital	*sepetlele*	feather	*lesiba*
hotel	*hotele*	funnel	*no Sesotho equivalent; English item used.*
letter	*lengolo*	gravy	*moro*
marriage	*lenyalo*	monkey	*tshwene*
mother	*mme*	onion	*eie*
night	*bosiu*	pig	*kolobe*
picture	*setshwantsho*	pill	*pilese*
plane	*sefofane*	potato	*tapole*
radio	*seyalemoya*	pupil	*leihlo*
school	*sekolo*	slope	*sekama*
student	*mothuti*	spider	*sekgo*
village	*motes*	tobacco	*kwae*
window	*fenstere*	tractor	*terekere*
summer	*selemo*	wheat	*mabele*

36. Oral reading, nonwords.

Original target	*Adapted target*	*Original target*	*Adapted target*
ked	ke	bem	be
nar	na	cug	ku
fon	fo	lat	la
shid	si	boak	bo
doop	do	birl	bi
dusp	du	soaf	vo
snite	ni	hance	no
hoach	go	smode	do
glope	lo	grest	ge
dringe	ri	squate	se
churse	ku	thease	te
shoave	fo	pretch	pe

45. Spelling to dictation, nonwords.

This subtest employs the same stimuli as subtest 36. Oral reading, nonwords.

46. Spoken word picture naming.

English target	*Sesotho adaptation*
carrot	*sehwete*
dog	*ntsha*
hosepipe	*no Sesotho equivalent; English item used.*
hat	*katiba*
axe	*selepe*
belt	*lebanta*
canoe	*no Sesotho equivalent; English item used.*
ladder	*lere*
television	*televisi*
moon	*kgwedi*
apple	*apole*
key	*senotlolo*
button	*konopo*
stool	*setulo*
syringe	*sepeti*
crown	*moqhaka*
cobweb	*tepu*
candle	*kerese*
lobster	*no Sesotho equivalent; English item used.*
stirrup	*setibile*
cow	*kgomo*
sword	*sabole*
comb	*kama*
eye	*leihlo*
rake	*haraka*
wall	*lebota*
underpants	*teranka*
nail	*sepekere*
paintbrush	*borosolo*
parachute	*no Sesotho equivalent; English item used.*
dart	*motsu*
pram	*no Sesotho equivalent; English item used.*
pipe	*peipi*
hammock	*no Sesotho equivalent; English item used.*
needle	*nale*
thumb	*motona*
bell	*tleloko*
shoe	*sieta*
mug	*lebekere*
stamp	*setempe*

47. Written word picture matching.

This subtest employs the same stimuli as subtest 46. Spoken word picture naming.

53. Picture naming X Oral reading, Repetition and Written Spelling.

English target	*Sesotho adaptation*
comb	*kama*
bear	*bere*
horse	*pere*
mountain	*thaba*
screw	*no Sesotho equivalent; English item used.*
anchor	*no Sesotho equivalent; English item used.*
glove	*no Sesotho equivalent; English item used.*
belt	*lebanta*
cow	*kgomo*
arrow	*motsu*
bowl	*sekotolo*
chair	*setulo*
glass	*kgalase*
bread	*bohobe*
shoe	*sieta*
iron	*tshepe*
elephant	*tlou*
swan	*no Sesotho equivalent; English item used.*
heart	*pelo*
eye	*leihlo*
bird	*nonyana*
monkey	*tshwene*
ladder	*lere*
rabbit	*mutlwa*
star	*naledi*
brush	*borosolo*
thumb	*motona*
scissors	*sekere*
toaster	*no Sesotho equivalent; English item used.*
watch	*watjhe*
seal	*dekesele*
dog	*ntsha*
yacht	*sekepe*
foot	*leoto*
swing	*thapo*
lemon	*lamanu*
knife	*thipa*
fish	*thlapi*
onion	*eie*

54. Picture naming X Frequency.

English target: high frequency	*Sesotho adaptation*	*English target: medium frequency*	*Sesotho adaptation*	*English target: low frequency*	*Sesotho adaptation*
window	*fenstere*	jacket	*baki*	cannon	*kanono*
watch	*watjhe*	clock	*horolosi*	stool	*setulo*
train	*terene*	fence	*lebota*	clown	*no Sesotho equivalent'; English item used*
table	*tafula*	lemon	*lamanu*	camel	*kamele*
key	*senotlolo*	hat	*katiba*	axe	*selepe*
house	*ntlo*	shirt	*hembe*	broom	*lefielo*
horse	*pere*	snake	*noha*	flute	*no Sesotho equivalent'; English item used*
heart	*pelo*	screw	*no Sesotho equivalent'; English item used*	glove	*no Sesotho equivalent'; English item used*
hair	*moriri*	belt	*lebanta*	frog	*sinqanqane*
hand	*letsoho*	bird	*nonyana*	harp	*no Sesotho equivalent'; English item used*
glass	*kgalase*	swing	*thapo*	snail	*kgofu*
door	*monyako*	tree	*sefate*	sock	*sokisi*
church	*kereke*	cloud	*leru*	grapes	*morara*
book	*buku*	desk	*tafula*	comb	*kama*
bottle	*botlolo*	ladder	*lere*	hammer	*hamore*
ball	*bolo*	lock	*senotlolo*	leaf	*lehlare*
arm	*lenaka*	ear	*tsebe*	owl	*sephooko*
knife	*thipa*	sheep	*nku*	thumb	*motona*
telephone	*founa*	cigarette	*kwae*	butterfly	*serurubele*
gun	*sethunya*	cup	*kopi*	nut	*letokomane*

Appendix IV: Word Lists.

Body Parts

Treatment		*Semantically Related*	
1. neck	*Molala*	11. hair	*moriri*
2. hand	*Letsoho*	12. head	*hlooho*
3. tooth	*Leino*	13. back	*mokoktlo*
4. bone	*Lesapo*	14. skull	*lehata*
5. fingers	*Monwana*	15. ear	*tsebe*
6. elbow	*Setswe*	16. nose	*nko*
7. foot	*Leoto*	17. ankle	*leqaqalaina*
8. knee	*Lengole*	18. blood	*madi*
9. tongue	*Leleme*	19. eye	*leihlo*
10. arm	*Sephaka*	20. skin	*letlalo*

Animals

Treament		*Semantically Related*	
1. dove	*Leeba*	11. hippo	*kubu*
2. leopard	*Lengau*	12. dog	*ntsha*
3. chameleon	*Leobu*	13. elephant	*tlou*
4. crab	*Lekgala*	14. snake	*noha*
5. spider	*Sekgo*	15. grasshopper	*tsie*
6. duck	*Lletata*	16. cat	*katse*
7. butterfly	*Serurubele*	17. fish	*hlapi*
8. lizard	*mokgodutswane*	18. ostrich	*mpshe*
9. frog	*Letlametlo*	19. pig	*kolobe*
10. worm	*Seboko*	20. rhinoceros	*tshukudu*

Food and drink

Treatment		*Semantically Related*	
1. grapes	*Morara*	11. meat	*nama*
2. spinach	*Moroga*	12. banana	*panama*
3. milk	*Lebese*	13. orange	*lamanu*
4. butter	*Sereledi*	14. maize	*poone*
5. wheat	*Mabele*	15. apple	*apole*
6.watermelon	*Lehapu*	16. peach	*perekisi*
7. pumpkin	*Mokupu*	17. beans	*dinawa*
8. bread	*Bohobe*	18. potato	*tapole*
9. eggs	*Lehe*	19. onion	*eie*
10. carrot	*Sehwete*	20. dough	*hlama*

Household artifacts

Treatment		*Semantically Related*	
1. chair	*Setulo*	11.bed	*bethe*
2. umbrella	*Sekgele*	12.candle	*kerese*
3. light	*Lebone*	13. telephone	*founa*
4. broom	*Lefielo*	14. key	*senotlolo*
5. walking stick	*Lere*	15.cup	*kopi*
6. string	*Mohala*	16. tap	*pompe*
7. picture	*setshwantsho*	17. bucket	*emere*
8. roof	*Marulelo*	18. book	*buku*
9. ax	*Selepe*	19. stove	*setofo*
10.door	*Monyako*	20. knife	*thipa*

Appendix V: Cue lists.

Animals

Treatment		*Cue*
1. dove	*leeba*	*le-*
2. leopard	*lengau*	*le-*
3. chameleon	*leobu*	*le-*
4. crab	*lekgala*	*le-*
5.spider	*sekgo*	*se-*
6.duck	*letata*	*le*
7.butterfly	*serurubele*	*se*
8. lizard	*mokgodutswane*	*mo*
9. frog	*letlametlo*	*le*
10. worm	*seboko*	*se*

Food and drink

Treatment		*Cue*
1. grapes	*morara*	*-ra-*
2. spinach	*moroga*	*-ro-*
3.milk	*lebese*	*-be-*
4.butter	*sereledi*	*-re-*
5.wheat	*mabele*	*-be-*
6.watermelon	*lehapu*	*-ha-*
7. pumpkin	*mokupu*	*-ku-*
8.bread	*bohobe*	*-ho-*
9.eggs	*lehe*	*-he*
10.carrot	*sehwete*	*-hwe-*

Appendix VI: Site permission letter.

Dear Sir;

I have registered for my master's degree in speech-language pathology this year. As part of the requirements for this degree, I need to complete a small research project. I want to thus obtain permission from yourself to conduct the project at the speech and hearing clinic of Metsimaholo Hospital. The research which I want to conduct will be based on my interactions with two of my current patients who are receiving speech therapy for aphasia (language difficulties related to stroke) at this hospital. The research revolves around using new techniques when working with patients who speak Sesotho. The techniques are non-invasive, and there is no risk associated with participation in this research. I am being supervised by Professor Claire Penn (a pioneer in the field of speech-language pathology in SA and an internationally respected researcher and scientist) at WITS, and all ethical aspects of this research are overseen by the Non-Medical Human Research Ethics Committee at WITS University.

I believe that this research will enable me to provide a better service to my patients. Further, it will enable me to comply more closely with COHSASA standards which mandate that clinicians participate in ongoing research and related activities.

The Non-Medical Human Research Ethics Committee requires that I obtain written permission from the institution in which I wish to conduct my research. I trust that my request will meet with a favorable reply. I have attached my proposal and ethics documents for your reference. Please let me know if there is any further information that you require.

Thank you
Brent Archer

Appendix VII: Participant consent form (English).

Dear Sir/Madam;

My name is Brent Archer. I am a speech-language therapist and researcher at WITS university. I am doing research into how stroke can affect a person's ability to name pictures and ways to help this problem. I invite you to take part in this study.

If you take part in this study, you will need to come to the hospital. There will be two sessions every week for nine weeks. You will also need to come for final therapy sessions one month after we have finished the study.

During therapy, I will to understand how a stroke has affected your listening and speaking abilities. I will also ask you questions about which languages you speak and how long you have been speaking them. You will also be asked to name pictures of everyday objects and actions. It may be difficult to name these pictures, and I will provide you with clues which may help you to name the pictures better. The study will be looking at which of these clues is the best at helping you name pictures. You, me, your caregiver and an interpreter will be the only people present during sessions.

You will not be paid to participate in this study. I will pay for your transport costs to and from therapy sessions. You may stop taking part in this study at any time, for any reason. You will be able to continue with speech-language therapy at Metsimaholo District Hospital, or any other site where speech-language therapy is provided, even if you choose to withdraw from this study. None of your personal details will appear anywhere in the study. The interpreter has signed a document forbidding her to disclose any of your details to anybody.

If you have any questions about this study, please contact me.

Brent Ernest Archer
072 414 4538

I ____________________________________ (full name and surname), ________________________ (ID Number) agree to participate in the study outlined above. I understand the possible risks and benefits involved. I understand that I may withdraw from this study at any time.

Signed:_______________________ Date:_________________________

Appendix VIII: Response records for participant T.

RESPONSE RECORD.

PARTICIPANT T; TREATMENT CONDITION 1 (CS)

WORD LIST: 'BODT PARTS'

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
neck (molala) NO RESPONSE	hair (moriri) CIRCUMLOCUTION: 'on your head'	neck (molala) CORRECT	Hair (moriri) CIRCUMLOCUTION: 'on your head'	neck (molala) CORRECT
hand (letsoho) NO RESPONSE	head (hlooho) PART WORD PRODUCTION: /hlo/	hand (letsoho) NO RESPONSE	head (hlooho) PART WORD PRODUCTION: /hlo/	hand (letsoho) NO RESPONSE
tooth (leino) NO RESPONSE	back (mokoktlo) NO RESPONSE	tooth (leino) NO RESPONSE	back (mokoktlo) CORRECT	tooth (leino) NO RESPONSE
bone (lesapo) PART WORD	skull (lehata) CORRECT	bone (lesapo) PART WORD	skull (lehata) CORRECT	bone (lesapo) PART WORD

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
PRODUCTION:/l/		PRODUCTION:/l/		PRODUCTION:/L/
finger (monwana) CIRCUMOLOCUTION: 'on the hand, point, touch things'	ear (tsebe) CORRECT	finger (monwana) CIRCUMOLOCUTION: 'on the hand, point, touch things'	ear (tsebe) CORRECT	finger (monwana) NO RESPONSE
elbow (setswe) CORRECT	nose (nko) PART WORD PRODUCTION:/nk/	elbow (setswe) CORRECT	Nose (nko) PART WORD PRODUCTION:/nk/	elbow (setswe) CORRECT
foot (leoto) NO RESPONSE	ankle (leqaqalaina) VOCALIZERS	foot (leoto) NO RESPONSE	ankle (leqaqalaina) VOCALIZERS	foot (leoto) SEMANTIC PARAPHASIA: 'shoe'
knee (lengole) VOCALIZERS	blood (madi) NO RESPONSE	knee (lengole) VOCALIZERS	blood (madi) NO RESPONSE	knee (lengole) NO RESPONSE
tongue (leleme) CIRCUMLOCUTION: 'in the mouth, long, red, that thing in the mouth'	eye (leihlo) CORRECT	tongue (leleme) CIRCUMLOCUTION: 'in the mouth, long, red, that thing in the mouth'	eye (leihlo) CORRECT	tongue (leleme) CIRCUMLOCUTION: 'that thing in the mouth'

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
arm (sephaka) PART WORD PRODUCTION: /s/	skin (letlalo) PART WORD PRODUCTION: /l/	arm (sephaka) CORRECT	Skin (letlalo) PART WORD PRODUCTION: /l/	arm (sephaka) NO RESPONSE
TOTAL: NO RESPONSE: 4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:2 VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS:2 OTHER: CORRECT: 1	TOTAL: NO RESPONSE:2 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:1 VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS:3 OTHER: CORRECT: 3	TOTAL: NO RESPONSE: 3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:2 VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS:1 OTHER: CORRECT: 3	TOTAL: NO RESPONSE:1 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:1 VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS:3 OTHER: CORRECT: 4	TOTAL: NO RESPONSE: 5 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:1 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:1 VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:1 OTHER: CORRECT:2

RESPONSE RECORD.

PARTICIPANT T; TREATMENT CONDITION 2 (IPC)

WORD LIST: 'ANIMALS'

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
dove (leeba) NO RESPONSE	hippo (kubu) VOCALIZERS	dove (leeba) CORRECT	hippo (kubu) PART WORD PRODUCTION:/k/	dove (leeba) NO RESPONSE
leopard (lengau) NO RESPONSE	dog (ntsha) GESTURES: patting lap	leopard (lengau) NO RESPONSE	dog (ntsha) NO RESPONSE	leopard (lengau) NO RESPONSE
chameleon (leobu) NO RESPONSE	elephant (tlou) CORRECT	chameleon (leobu) NO RESPONSE	elephant (tlou) CORRECT	chameleon (leobu) NO RESPONSE
crab (lekgala) CIRCUMLOCUTION: 'lives by the sea'	snake (noha) NO RESPONSE	crab (lekgala) NO RESPONSE	snake (noha) NO RESPONSE	crab (lekgala) NO RESPONSE
spider (sekgo) PART WORD PRODUCTION: /s/	grasshopper (tsie) NO RESPONSE	spider (sekgo) PART WORD PRODUCTION: /s/	grasshopper (tsie) CORRECT	spider (sekgo) PART WORD PRODUCTION :/s/

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
duck (letata) CORRECT	cat (katse) PART WORD PRODUCTION: /k/	duck (letata) CORRECT	cat (katse) PART WORD PRODUCTION: /k/	duck (letata) CORRECT
butterfly (serurbele) CIRCUMLOCUTION: ‘a flying animal’	fish (hlapi) CORRECT	butterfly (serurbele) CIRCUMLOCUTION: ‘a flying animal’	fish (hlapi) CORRECT	butterfly (serurbele) SEMANTIC PARAPHASIA: ‘bee’
lizard (mokgodutswane) VOCALIZERS	ostrich (mpshe) CIRCUMLOCUTION: ‘big bird’	lizard (mokgodutswane) NO RESPONSE	ostrich (mpshe) CIRCUMLOCUTION: ‘big bird; can’t fly’	lizard (mokgodutswane) NO RESPONSE
frog (letlametlo) CORRECT	pig (kolobe) SEMANTIC PARAPHASIA: ‘horse’	frog (letlametlo) CORRECT	pig (kolobe) NO RESPONSE	frog (letlametlo) CORRECT
worm (seboko) NO RESPONSE	rhinoceros (tshukudu) NO RESPONSE	worm (seboko) CORRECT	rhinoceros (tshukudu) NO RESPONSE	worm (seboko) SEMANTIC PARAPHASIA : ‘snake’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
TOTAL: NO RESPONSE: 4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: 2 VOCALIZERS: 1 GESTURE: PART WORD PRODUCTIONS:1 OTHER: CORRECT: 2	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:1 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:1 VOCALIZERS:1 GESTURE:1 PART WORD PRODUCTIONS:1 OTHER: CORRECT:2	TOTAL: NO RESPONSE:4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:1 VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:1 OTHER: CORRECT:4	TOTAL: NO RESPONSE:4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION:1 VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:2 OTHER: CORRECT:3	TOTAL: NO RESPONSE:5 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:1 OTHER: CORRECT:2

RESPONSE RECORD.

PARTICIPANT T; TREATMENT CONDITION 3 (TPC)

WORD LIST: ‘FOOD AND DRINK’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
grapes(morara) NO RESPONSE	meat (nama) PART WORD PRODUCTION :/n/	grapes(morara) CORRECT	meat (nama) PART WORD PRODUCTION: /n/	grapes(morara) NO RESPONSE
spinach (moroga) VOCALIZERS	banana (panama) NO RESPONSE	spinach (moroga) CORRECT	banana (panama) NO RESPONSE	spinach (moroga) CORRECT
milk (lebese) PART WORD PRODUCTION: /l/	orange (lamanu) NO RESPONSE	milk (lebese) CORRECT	orange (lamanu) NO RESPONSE	milk (lebese) CORRECT
butter (sereledi) NO RESPONSE	maize (poone) NO RESPONSE	butter (sereledi) CORRECT	maize (poone) NO RESPONSE	butter (sereledi) GESTURE: ‘spreading motion with hands as though buttering bread
wheat (mabele) NO RESPONSE	apple (apole) VOCALIZERS	wheat (mabele) CORRECT	apple (apole) VOCALIZERS	wheat (mabele) SEMANTIC PARAPHASIA: ‘milk’
watermelon (lehapu) CORRECT	peach (perekisi) NO RESPONSE	watermelon (lehapu) CORRECT	peach (perekisi) NO RESPONSE	watermelon (lehapu) CORRECT

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
pumpkin (mokupu) SEMANTIC PARAPHASIA: 'yellow'	bean (senawa) PART WORD PRODUCTION: /p/	pumpkin (mokupu) CORRECT	bean (senawa) VOCALIZER	pumpkin (mokupu) VOCALIZERS
bread (bohobe) NO RESPONSE	potatoe (tapole) CORRECT	bread (bohobe) CORRECT	potatoe (tapole) CORRECT	bread (bohobe) CORRECT
egg (mahe) NO RESPONSE	onion (eie) NO RESPONSE	egg (mahe) CORRECT	onion (eie) CORRECT	egg (mahe) CORRECT
carrot (sehwete) SEMANTIC PARAPHASIA: 'tomato'	dough (hlama) SEMANTIC PARAPHASIA: 'bread'	carrot (sehwete) PHONEMIC PARAPHASIA: 'femete'	dough (hlama) CORRECT	carrot (sehwete) NO RESPONSE
TOTAL: NO RESPONSE: 5 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1	TOTAL: NO RESPONSE:5 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:1 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1	TOTAL: NO RESPONSE: PHONEMIC PARAPHASIA:1 SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:	TOTAL: NO RESPONSE:4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:2	TOTAL: NO RESPONSE:2 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:1 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
GESTURE: PART WORD PRODUCTIONS:1 OTHER: CORRECT:1	GESTURE: PART WORD PRODUCTIONS:2 OTHER: CORRECT:1	GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT:9	GESTURE: PART WORD PRODUCTIONS:1 OTHER: CORRECT:3	GESTURE:1 PART WORD PRODUCTIONS: OTHER: CORRECT:5

RESPONSE RECORD.

PARTICIPANT T; TREATMENT CONDITION 4 (PROS)

WORD LIST: ‘HOUSEHOLD ARTEFACTS’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
chair (setulo) OTHER	bed (bethe) NO RESPONSE	chair (setulo) CORRECT	bed (bethe) NO RESPONSE	chair (setulo) CORRECT
umbrella (sekgele) NO RESPONSE	candle (kerese) PART WORD PRODUCTION: /k/	umbrella (sekgele) CORRECT	candle (kerese) PART WORD PRODUCTION: /k/	umbrella (sekgele) NO RESPONSE
light (lebone) VOCALIZER	telephone (founa) OTHER	light (lebone) VOCALIZER	telephone (founa) SEMANTIC PARAPHASIA: ‘ear’	light (lebone) VOCALIZER
broom (lefielo) PART WORD PRODUCTION: /l/	key (senotlolo) NO RESPONSE	broom (lefielo) CORRECT	key (senotlolo) NO RESPONSE	broom (lefielo) CORRECT
walking stick (lere) NO RESPONSE	cup (kopi) CORRECT	walking stick (lere) CORRECT	cup (kopi) CORRECT	walking stick (lere) CORRECT

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
string (mohala) VOCALIZER	tap (pompe) NO RESPONSE	string (mohala) VOCALIZER	tap (pompe) NO RESPONSE	string (mohala) VOCALIZER
picture (setshwantsho) PART WORD PRODUCTION: /s/	bucket (emere) NO RESPONSE	picture (setshwantsho) CORRECT	bucket (emere) NO RESPONSE	picture (setshwantsho) CORRECT
roof (marulelo) NO RESPONSE	book (buku) PHONEMIC PARAPHASIA: ‘vusu’	roof (marulelo) CORRECT	book (buku) NO RESPONSE	roof (marulelo) CORRECT
ax (selepe) NO RESPONSE	stove (setofo) NO RESPONSE	ax (selepe) CORRECT	stove (setofo) NO RESPONSE	ax (selepe) GESTURE: chopping motion with hand
door (monyahko) PART WORD PRODUCTION: /m/	knife (thipa) PART WORD PRODUCTION: /th/	door (monyahko) CORRECT	knife (thipa) PART WORD PRODUCTION: /th/	door (monyahko) CORRECT
TOTAL: NO RESPONSE:4	TOTAL: NO RESPONSE:5	TOTAL: NO RESPONSE:	TOTAL: NO RESPONSE:6	TOTAL: NO RESPONSE:1

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:2 GESTURE: PART WORD PRODUCTIONS:3 OTHER:1 CORRECT:0	PHONEMIC PARAPHASIA:1 SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:2 OTHER:1 CORRECT: 1	PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:2 GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT:8	PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:1 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:2 OTHER: CORRECT:1	PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:2 GESTURE:1 PART WORD PRODUCTIONS: OTHER: CORRECT:6

Appendix IX: Response records for participant S.

RESPONSE RECORD.

PARTICIPANT S; TREATMENT CONDITION 1 (CS)

WORD LIST: ‘BODY PARTS’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
neck (molala) NO RESPONSE	hair (moriri) SEMANTIC PARAPHASIA: ‘shave’	neck (molala) SEMANTIC PARAPHASIA: ‘ swallow’	hair (moriri) SEMANTIC PARAPHASIA: ‘shave’	neck (molala) NO RESPONSE
hand (letsoho) SEMANTIC PARAPHASIA: ‘foot’	head (hlooho) CORRECT	hand (letsoho) SEMANTIC PARAPHASIA: ‘glove, foot, shoe’	head (hlooho) CORRECT	hand (letsoho) SEMANTIC PARAPHASIA: ‘foot’
tooth (leino) SEMANTIC PARAPHASIA: ‘smile’ (noun)	back (mokoktlo) NO RESPONSE	tooth (leino) CORRECT	back (mokoktlo) SEMANTIC PARAPHASIA: ‘shoulder, arm’	tooth (leino) NO RESPONSE

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
bone (lesapo) NO RESPONSE	skull (lehata) NO RESPONSE	bone (lesapo) NO RESPONSE	skull (lehata) SEMANTIC PARAPHASIA: ‘dead person, grave’	bone (lesapo) OTHER
finger (monwana) CORRECT	ear (tsebe) CORRECT	finger (monwana) CORRECT	ear (tsebe) CORRECT	finger (monwana) CORRECT
elbow (setswe) VOCALIZERS	nose (nko) VOCALIZER	elbow (setswe) SEMANTIC PARAPHASIA: ‘bend’ (verb)	nose (nko) VOCALIZER	elbow (setswe) VOCALIZER
foot (leoto) SEMANTIC PARAPHASIA: ‘shoe’	ankle (leqaqalaina) OTHER	foot (leoto) SEMANTIC PARAPHASIA: ‘walk’ (verb)	ankle (leqaqalaina) SEMANTIC PARAPHASIA: ‘toe’ ‘foot’	foot (leoto) NO RESPONSE
knee (lengole) NO RESPONSE	blood (madi) PHONEMIC PARAPHASIA: ‘nati’	knee (lengole) NO RESPONSE	blood (madi) PHONEMIC PARAPHASIA: ‘nati’	knee (lengole) NO RESPONSE
tongue (leleme) NO RESPONSE	eye (leihlo) CORRECT	tongue (leleme) CORRECT	eye (leihlo) CORRECT	tongue (leleme) SEMANTIC PARAPHASIA: ‘eat’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
arm (sephaka) SEMANTIC PARAPHASIA: ‘ long’	skin (letlalo) NO RESPONSE	arm (sephaka) NO RESPONSE	skin (letlalo) SEMANTIC PARAPHASIA: ‘black, white’	arm (sephaka) NO RESPONSE
TOTAL: NO RESPONSE: 4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: 4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT: 1	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA:1 SEMANTIC PARAPHASIA:1 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER:1 CORRECT: 3	TOTAL: NO RESPONSE: 3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT: 3	TOTAL: NO RESPONSE:0 PHONEMIC PARAPHASIA: 1 SEMANTIC PARAPHASIA: 5 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT: 3	TOTAL: NO RESPONSE: 5 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER:1 CORRECT:1

RESPONSE RECORD.

PARTICIPANT S; TREATMENT CONDITION 2 (IPC)

WORD LIST: ‘ANIMALS’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
dove (leeba) SEMANTIC PARAPHASIA: ‘wing’	hippo (kubu) NO RESPONSE	dove (leeba) SEMANTIC PARAPHASIA: ‘wing, fly (verb)’	hippo (kubu) SEMANTIC PARAPHASIA: ‘horse’	dove (leeba) SEMANTIC PARAPHASIA: ‘wing, nest, tree, fly’
leopard (lengau) NO RESPONSE	dog (ntsha) SEMANTIC PARAPHASIA: ‘cat’	leopard (lengau) SEMANTIC PARAPHASIA: ‘lion’	dog (ntsha) SEMANTIC PARAPHASIA: ‘bite’ (verb)	leopard (lengau) SEMANTIC PARAPHASIA: ‘lion’
chameleon (leobu) PHONEMIC PARAPHASIA: ‘lumu’	elephant (tlou) CORRECT	chameleon (leobu) NO RESPONSE	elephant (tlou) CORRECT	chameleon (leobu) NO RESPONSE
crab (lekgala) SEMANTIC PARAPHASIA: ‘crawl’ (verb)	snake (noha) SEMANTIC PARAPHASIA: ‘dangerous’	crab (lekgala) SEMANTIC PARAPHASIA: ‘sea, shell’	snake (noha) SEMANTIC PARAPHASIA: ‘danegrous’	crab (lekgala) SEMANTIC PARAPHASIA: ‘sea, shell’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
spider (sekgo) NO RESPONSE	grasshopper (tsie) NO RESPONSE	spider (sekgo) NO RESPONSE	grasshopper (tsie) SEMANTIC PARAPHASIA: ‘fly’ (noun)	spider (sekgo) NO RESPONSE
duck (letata) NO RESPONSE	cat (katse) CORRECT	duck (letata) SEMANTIC PARAPHASIA: ‘water’ (noun)	cat (katse) CORRECT	duck (letata) SEMANTIC PARAPHASIA: ‘water’
butterfly (serurbele) SEMANTIC PARAPHASIA: ‘bee’	fish (hlapi) NO RESPONSE	butterfly (serurbele) GESTURE: hand flapping motion	fish (hlapi) CORRECT	butterfly (serurbele) GESTURE: hand flapping motion
lizard (mokgodutswane) OTHER	ostrich (mpshe) GESTURE: arm used to mimic long neck	lizard (mokgodutswane) NO RESPONSE	ostrich (mpshe) SEAMNTIC PARAPHASIA: ‘duck’ (noun)	lizard (mokgodutswane) NO RESPONSE
frog (letlametlo) SEMANTIC PARAPHASIA: ‘lizard’	pig (kolobe) OTHER: grunting noises	frog (letlametlo) SEMANTIC PARAPHASIA: ‘lizard, wet (adjective), jump (verb)’	pig (kolobe) CORRECT	frog (letlametlo) SEMANTIC PARAPHASIA: ‘lizard, wet, jump’

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
worm (seboko) CORRECT	rhinoceros (tshukudu) NO RESPONSE	worm (seboko) CORRECT	rhinoceros (tshukudu) SEMANTIC PARAPHASIA: 'big, horn'	worm (seboko) CORRECT
TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:4 PHONOSEMANTIC PARAPHASIA:1 CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS: OTHER:1 CORRECT:1	TOTAL: NO RESPONSE:4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE:1 PART WORD PRODUCTIONS: OTHER:1 CORRECT:2	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE:1 PART WORD PRODUCTIONS: OTHER: CORRECT:2	TOTAL: NO RESPONSE: PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: 6 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT:4	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE:1 PART WORD PRODUCTIONS: OTHER: CORRECT:2

RESPONSE RECORD.

PARTICIPANT S; TREATMENT CONDITION 3 (TPC)

WORD LIST: 'FOOD AND DRINK'

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
grapes(morara) GESTURE: putting grapes into mouth	meat (nama) VOCALIZER	grapes(morara) CORRECT	meat (nama) NO RESPONSE	grapes(morara) GESTURE: putting grapes into mouth
spinach (moroga) PHONEMIC PARAPHASIA: oroba	banana (panama) CORRECT	spinach (moroga) CORRECT	banana (panama) CORRECT	spinach (moroga) CORRECT
milk (lebese) SEMANTIC PARAPHASIA: 'cow'	orange (lamanu) NO RESPONSE	milk (lebese) CORRECT	orange (lamanu) NO RESPONSE	milk (lebese) CORRECT
butter (sereledi) SEMANTIC PARAPHASIA: 'bread'	maize (poone) CORRECT	butter (sereledi) CORRECT	maize (poone) CORRECT	butter (sereledi) SEMANTIC PARAPHASIA: 'bread'
wheat (mabele) NO RESPONSE	apple (apole) SEMANTIC PARAPHASIA: 'tree'	wheat (mabele) CORRECT	apple (apole) CORRECT	wheat (mabele) NO RESPONSE

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
watermelon (lehapu) CORRECT	peach (perekisi) SEMANTIC PARAPHASIA: ‘red’	watermelon (lehapu) CORRECT	peach (perekisi) SEMANTIC PARAPHASIA: ‘red’	watermelon (lehapu) CORRECT
pumpkin (mokupu) SEMANTIC PARAPHASIA: ‘potatoe’	bean (senawa) SEMANTIC PARAPHASIA: ‘food’	pumpkin (mokupu) CORRECT	bean (senawa) VOCALIZER	pumpkin (mokupu) NO RESPONSE
bread (bohobe) GESTURE: cutting motion, cutting bread slice.	potatoe (tapole) CORRECT	bread (bohobe) CORRECT	potatoe (tapole) CORRECT	bread (bohobe) CORRECT
egg (mahe) SEMANTIC PARAPHASIA: ‘chicken’	onion (eie) SEMANTIC PARAPHASIA: ‘tears’ (noun)	egg (mahe) CORRECT	onion (eie) SEMANTIC PARAPHASIA: ‘tears’ (noun)	egg (mahe) SEMANTIC PARAPHASIA: ‘chicken’
carrot (sehwete) SEMANTIC PARAPHASIA: ‘long’	dough (hlama) NO RESPONSE	carrot (sehwete) NO RESPONSE	dough (hlama) OTHER	carrot (sehwete) NO RESPONSE
TOTAL: NO RESPONSE:1 PHONEMIC PARAPHASIA:1 SEMANTIC	TOTAL: NO RESPONSE:2 PHONEMIC PARAPHASIA: SEMANTIC	TOTAL: NO RESPONSE:1 PHONEMIC PARAPHASIA: SEMANTIC	TOTAL: NO RESPONSE:2 PHONEMIC PARAPHASIA: SEMANTIC	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA: SEMANTIC

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
PARAPHASIA:5 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE:2 PART WORD PRODUCTIONS: OTHER: CORRECT:1	PARAPHASIA:4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT:3	PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS: OTHER: CORRECT:9	PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:1 GESTURE: PART WORD PRODUCTIONS: OTHER:1 CORRECT:4	PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE:1 PART WORD PRODUCTIONS: OTHER: CORRECT:4

RESPONSE RECORD.

PARTICIPANT S; TREATMENT CONDITION 4 (PROS)

WORD LIST: 'HOUSEHOLD ARTIFACTS'

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
chair (setulo) CORRECT	bed (bethe) SEMANTIC PARAPHASIA: 'sleep' (verb)	chair (setulo) CORRECT	bed (bethe) SEMANTIC PARAPHASIA: 'sleep' (verb)	chair (setulo) CORRECT

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
umbrella (sekgele) NO RESPONSE	candle (kerese) SEMANTIC PARAPHASIA: ‘matches’	umbrella (sekgele) SEMANTIC PARAPHASIA: ‘rain’ (noun)	candle (kerese) CORRECT	umbrella (sekgele) SEMANTIC PARAPHASIA: ‘rain’
light (lebone) SEMANTIC PARPHASIA: ‘candle’	telephone (founa) VOCALIZER	light (lebone) CORRECT	telephone (founa) NO RESPONSE	light (lebone) CORRECT
broom (lefielo) NO RESPONSE	key (senotlolo) CORRECT	broom (lefielo) CORRECT	key (senotlolo) CORRECT	broom (lefielo) CORRECT
walking stick (lere) SEMANTIC PARAPHASIA: ‘old person’	cup (kopi) SEMANTIC PARAPHASIA: ‘kettle’	walking stick (lere) CORRECT	cup (kopi) CORRECT	walking stick (lere) CORRECT
string (mohala) SEMANTIC PARAPHASIA: ‘thin’	tap (pompe) NO RESPONSE	string (mohala) CORRECT	tap (pompe) NO RESPONSE	string (mohala) NO RESPONSE
picture (setshwantsho) SEMANTIC PARAPHASIA: ‘far away’	bucket (emere) NO RESPONSE	picture (setshwantsho) CORRECT	bucket (emere) NO RESPONSE	picture (setshwantsho) NO RESPONSE

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
roof (marulelo) NO RESPONSE	book (buku) VOCALIZER	roof (marulelo) CORRECT	book (buku) SEMANTIC PARAPHASIA: ‘read’	roof (marulelo) SEMANTIC PARAPHASIA: ‘house’
ax (selepe) GESTURE: makes chopping motion with flat hand	stove (setofo) NO RESPONSE	ax (selepe) CORRECT	stove (setofo) SEMANTIC PARAPHASIA: ‘hot’	ax (selepe)
door (monyako) NO RESPONSE	knife (thipa) CORRECT	door (monyahko) CORRECT	knife (thipa) CORRECT	door (monyako) CORRECT
TOTAL: NO RESPONSE:4 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:4 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE:0 PART WORD PRODUCTIONS:	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:3 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS:2 GESTURE: PART WORD PRODUCTIONS:	TOTAL: NO RESPONSE: PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA: PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:	TOTAL: NO RESPONSE:3 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:3 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:	TOTAL: NO RESPONSE:2 PHONEMIC PARAPHASIA: SEMANTIC PARAPHASIA:2 PHONOSEMANTIC PARAPHASIA: CIRCUMLOCUTION: VOCALIZERS: GESTURE: PART WORD PRODUCTIONS:

Pre-treatment		*Post-treatment*		*Follow-up*
Treatment List	Semantically Related List	Treatment List	Semantically Related List	Treatment List
OTHER: CORRECT:2	OTHER: CORRECT:2	OTHER: CORRECT:10	OTHER: CORRECT:4	OTHER: CORRECT:7

Appendix X: Picture samples.

Samples provided:

BODY PARTS: 15. ear

ANIMALS: 9. frog

FOOD AND DRINK: 8. bread

HOUSEHOLD ARTIFACTS: 18. book

The pictures provided here have been scaled down in size. Those used in the study were rendered in A4 formats.




Appendix XI: Phonetic inventory of Sesotho.

		Labial	Alveolar		Post-alveolar	Palatal	Velar	Uvular	Glottal
			Central	Lateral					
Click	glottalized								
	aspirated								
	nasal								
Nasal Stop									
Plosive	ejective								
	aspirated								
	voiced								
Affricate	ejective								
	aspirated								
Fricative	voiceless								
	voiced								
Approximant									
Trill									

(after Doke and Mofokeng, 1974, and Lewis, 2009).

Appendix XII: Ethical oversight documents.